12. THE CONSUMER'S BEHAVIOUR – DECISIVE FACTOR FOR THE FIRM'S DEVELOPMENT STRATEGY

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Abstract

The paper approach problems of a great actuality – the substantiation of the Firm's Development Strategy, viewed from the perspective of knowing and modeling the clients buying and consuming behavior, of the integration of this behavior in the development of firm's communication process with business environment

The substantiation of a global strategy for the firm, coherent and efficient requires the effort to promote a business culture realistic oriented towards the market and to the consumer.

As while as decision factors ignore the essential co-ordinates of the consumer's values system, as while as output of goods and the performance of services are not adjusted to the consumer needs and aspirations, there can be manifested serious disfunctionalities in the economical and social system characteristic for a national market.

We develop the consumer's behavior concept; synthesize the main theories and models regarding consumer's behavior. Also, we develop the idea of bringing the behavioral studies into substantiation of the firms marketing strategies, of the necessity to build up a real and constant communication between the two entities – "client – firm"

The consumer's behavior will play a decisive roll in the orientation of the external environment research effort, in the substantiation of the communication effort of the firm, as well as regarding the continuous adaptation of it from the prospect of politics substantiation regarding marketing mix elements and harmonization between the image and values of the firm and the perception and the values system of the consumer.

Numerous firms organized according to modern marketing principles succeed to know and to satisfy at a good level the requirements and needs of their own consumers, however there are still few that succeed to build a real and substantial dialog, on a long term with the clients, dialog which surpass the frame of the economic motivated relations (selling – buying) between the two entities.

At the end of the paper, we distinguish the main tendencies that could be crystallized concerning the approach of the new cultural dimensions of the consumer's behavior, the contribution that is brought by relational marketing in this sense being substantial.

Key words: *consumer's behavior, modeling, motivation, communication, marketing mix, strategic planning, forecasts, relational marketing*

13. THE CORPORATE WEB SITE AND ITS FUNCTIONS WITHIN THE INFORMATION SYSTEM OF ROMANIAN FIRMS

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Abstract

The Internet becomes an important element of the enterprise information system, providing facilities to collect market data, or to communicate with the main target audiences. However, the implementation of the Internet system can be difficult in transition economies, where the price of setting up and maintaining a corporate web site can be quite high. Therefore firms will adopt various web site strategies and formats, depending on their level of resources and the corporate strategic objectives. This paper present the results of a survey regarding the implementation and operational procedures used by Romanian firms to set up and use a corporate web site.

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The specific conditions of Internet-IS strategy in a transition economy

The integration between the corporate web site and the internal information system can raise specific challenges in an economy in transition. If the design and implementation of the corporate web site can be quite simple in a developed country, with a developed telecommunication infrastructure and easily available professional support, the lack of these conditions in a developing country can make the set up of the corporate web site a more difficult enterprise. On the other hand, even when available, the specialist services in designing the web site can be quite expensive in terms of relative value, for the SMEs. It can be therefore expected that many of these enterprises will take advantage of their internal resources and expertise to design and implement the corporate web site at least in the initial stages of Internet presence. On the other hand it can be assumed that the companies which have specialist expertise in IT or Internet-related activities will have a higher propensity to use their own resources in setting up the corporate web site than the firms from other activity sectors. The following hypotheses can be therefore formulated:
H1. The propensity to implement the corporate web site using internal resources will be influenced by the size and the activity profile of the firm.

The capacity to effectively implement Internet-based systems and to integrate them with the existing information system of the enterprise is a function of resources and benefits. The resources are often dependent on the size of the firm, since larger companies are expected to control a larger volume and diversity of resources than the small ones. Secondly, the companies active in various industries will benefit differently from the introduction of the Internet-based information system. It is expected that the companies which are have IT or Internet-related activities will benefit more from these systems, than the ones that are active in more traditional industries. Considering this variability, the sector of activity of the respondent firms was considered as another important independent variable.

These company related variables are expected to have a significant influence on:
- *the functionality of the web site (H2);*
- *the interactive features of the web site (H3);*
- *the capacity of the firm to take advantage of the Internet-enabled capabilities in collecting information about, or communication information to, the company's customers(H4);*

The relationship between these variables has been in the research hypotheses H2-H4.

Although some of these restrictions might be present in all or most of the economies in transition, for an accurate research study it is essential to present and analyse the specific conditions of the business environment in the selected country: Romania.

Analysis and interpretation of data

The data collected showed that the method selected by the firms to design and implement their web site is not influenced by the size of the firm or the type of activity, but is statistically correlated with the company relation to IT technologies (see Table).

Table 1. Crosstabulation between the web site implementation method and the sector of activity of the respondent companies

Web site implementation/ Sector of activity		**Own resources**	**Specialised agency**	**ISP**	**Total**
Computer-related	**N**	18	1	0	19
	%	94.7	5.3	0	100
Internet-related	**N**	11	0	0	11
	%	100	0	0	100
Other	**N**	40	16	7	63
	%	63.5	25.4	11.1	100
Total		69	17	7	93

Chi square = 11.892 p = 0.018

As it can be seen in Table 1, all respondent firms that have Internet-related activities have designed and implemented the web site using their own resources. At the other extreme are the companies from sectors which are not IT or Internet-related. Although the majority of these firms have used their internal expertise to design the web site, one third of them have used either a specialised agency or the ISP.

Concluding remarks abstract

The present study has a number of limitations: the sample size is relatively small, and although the response rate is good, does not permit any valid generalisation of the findings. Also, the relation between the classical information system of the firm and the corporate web site needs a more in-depth exploration. Future research studies should also attempt to identify the impact of the web site implementation on the functional, architectural and organisational architecture of the enterprise information system.

Introduction: the role of the Internet in the networked economy

In the networked economy, the Internet represents an important element of the enterprise Information System (IS). The Internet has changed the functionality and the orientation of the enterprise information system. If the traditional information system was mainly focused on the internal storage and flow of information, the Internet had the effect to dynamically connect the firm with the external world. The functionality emphasis of information systems has changed from providing the managers with relevant and timely information for decision-making, to integrating the firm into the external information environment.

The Internet-IS integration process

The integration of the Internet functionality with the corporate information system needs to be planned and implemented carefully, in order to maximise the benefits for the enterprise. The Internet connection represents a first step towards accessing and collecting relevant data about the business environment, the target market and competition (Feher and Towell, 1997). The information collected online can be stored in company databases and analysed for strategic purposes (Mukherji, 2002). However, this is a passive approach to an Internet-supported strategy. In order to take advantage of the interactive nature of the Internet, the company should implement and manage a corporate web site.

The corporate web site has a rich functionality that can be fully exploited only through an organic integration with the enterprise information system (Granger and Schroeder, 1996). The web site will represent:

- an interface between the corporate information system and online customers;
- a promotional tool;
- a communication channel between online customers and the company;

All these functions are enhanced though the interactive characteristics of various Internet applications (email, discussion forums, web page customisation, etc.). These applications, however, will determine a complex restructuring of the enterprise information system, both at operational and at architectural level. On the other hand, the marketing and communications strategies of the company require integration with the online marketing strategy.

The specific conditions of Internet-IS strategy in a transition economy

The integration between the corporate web site and the internal information system can raise specific challenges in an economy in transition. If the design and implementation of the corporate web site can be

quite simple in a developed country, with a developed telecommunication infrastructure and easily available professional support, the lack of these conditions in a developing country can make the set up of the corporate web site a more difficult enterprise. On the other hand, even when available, the specialist services in designing the web site can be quite expensive in terms of relative value, for the SMEs. It can be therefore expected that many of these enterprises will take advantage of their internal resources and expertise to design and implement the corporate web site at least in the initial stages of Internet presence. On the other hand it can be assumed that the companies which have specialist expertise in IT or Internet-related activities will have a higher propensity to use their own resources in setting up the corporate web site than the firms from other activity sectors. The following hypotheses can be therefore formulated:
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An economy in transition - Romania

While Romania is often portrayed as a poor country, this image does not do justice to its large development potential. With over 22 million inhabitants, Romania has the second largest population (after Poland) in Central and Eastern Europe, and a large stock of skilled labour (EBRD, 2003).

The country has experienced high levels of inflation, a slight increase in the GDP per capita, and a constant devaluation of the national currency (lei). This had a negative effect on the internal financial stability and has reduced substantially the purchasing power of the Romanian citizens. Since 2000, the GDP growth rate has registered again positive figures, after a three years period of economic decline (1996-1999) (Isarescu, 2001).

The Romanian Internet infrastructure

The exponential growth of the Internet has become visible since 1995 in Romania. Despite progress made, the number of Internet users are far below the number of users in Western Europe and among the lowest numbers counted in Central and Eastern European countries (Bako, 2001).

The latest data available shows that the percentage of total population who are Internet users at the end of the year 2002 is 12%, with only 2% of the Internet users being classified as online shoppers. The main reason of Romanians for not buying online are problems related with credit check.

All this information needs to be taken into account when analysing and interpreting primary research data. The online capabilities are improving in Romania, but the development is slow and only marginally related with e-business activities.

Research methodology

In order to collect primary data related with the formulated research hypothesis, 350 questionnaires have been send by email to randomly selected Romanian firms. 101 of these questionnaires were returned, but only 96 of them were properly completed, and could be used for data analysis, resulting in a response rate of 27.4%.

The questions were grouped into 4 main categories:
1. Questions related with the company's profile in term of size and sector of activity.
The size of the firm was classified using the following criteria:
- small firms - up to 50 employees;
- medium-sized firms - between 51 and 500 employees;
- large firms - with more than 500 employees.

The sector of activity was classified using two different criteria:
a. the relation with IT technologies, which classifies the respondent firms in computer-related, Internet-related and other industries;
b. the type of activity, comprising: manufacturing, commerce, services, and other activities.

2. Questions related with the approach adopted for the web site implementation.
3. Questions related with the functionality and the interactive features of the web site.
4. Questions related with the capacity of the company to collect information and to communicate with its target audiences through the Internet system.

Analysis and interpretation of data

The data collected showed that the method selected by the firms to design and implement their web site is not influenced by the size of the firm or the type of activity, but is statistically correlated with the company relation to IT technologies (see Table).

Table 1. Crosstabulation between the web site implementation method and the sector of activity of the respondent companies

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Chi square = 11.892 p = 0.018

As it can be seen in Table 1, all respondent firms that have Internet-related activities have designed and implemented the web site using their own resources. At the other extreme are the companies from sectors which are not IT or Internet-related. Although the majority of these firms have used their internal expertise to design the web site, one third of them have used either a specialised agency or the ISP.

Therefore the research hypothesis:
H1. The propensity to implement the corporate web site using internal resources will be influenced by the size and the activity profile of the firm.

is only partially verified through the research findings.

The functionality of the web site is indeed influenced by the company's size and activity profile. The large firms tend to use the corporate web site mainly to promote the firm or to communicate with target audiences, on the other hand the small and medium sized firms are more active in using the Internet system for market research and online selling. The manufacturing firms tend to use the Internet only as a secondary channel of communication and promotion, while in the case of service providers (many of them IT-related), the web site has a multiple functionality: market research, promotion, communication and selling).

These findings support the research hypothesis that:
H2. The company's size and activity have a significant influence on the functionality of the web site.

The data collected show that the corporate web site of the small firms has more interactive features than the web site of medium-sized or large firms. The Internet can be used creatively by these companies to reach and communicate with their target audiences, with low costs and effort. The service provider companies implement web sites with higher levels of interactivity (email, discussion forums, on-line membership form) in comparison with manufacturing or commercial companies. However, in terms of their relationship with the IT technology the differences are small, although the Internet-related firms have, overall, a more interactive web site.

Considering these results, the research hypothesis:
H3. The company's size and activity have a significant influence on the interactivity of the web site.
is only partially verified.

The capacity to collect relevant information and to communicate with the targeted audiences, using the Internet, is expected to be influenced by the size, sector of activity, and the economic sector of the respondent firms. Although the implementation of the corporate web site will improve the communication exchanges between the firm and its competitive environment, the variety in strategic objectives, technical expertise and communication needs is expected to be shape the capacity to collect and/or distribute information though the Internet.

Table 2. Chi square test values for the relation between the company's size and profile and the firm's capacity to collect information or to communicate with target audiences

	Capacity to collect relevant information	**Capacity to communicate with target audiences**
Size	Chi Square = 5.307 p = 0.257	Chi Square = 17.800 p = 0.001
Sector of activity	Chi Square = 5.089 p = 0.278	Chi Square = 7.157 p = 0.128
Economic sector	Chi Square = 0.974 p = 0.987	Chi Square = 3.976 p = 0.680

The results shown in Table 2 (Chi square test values) only partially support the research hypothesis:
H3. The company's size and activity have a significant influence on the capacity of the firm to collect information and communicate with its target audiences using Internet systems.

Only the size of the firm has a statistically significant influence on the capacity of the firm to communicate with its target audiences (the larger the firm, the better targeted is the communication strategy on the Internet). In the case of the other firm's characteristics the influence is negligible. This finding can be interpreted in the sense that although the Internet provides a level plain field for companies of different sizes and organisational structures, in the case of marketing communication, additional resources and expertise can determine a difference in selecting and targeting the high priority audiences.

This paper attempted to briefly present a research project investigating the use of corporate web sites by Romanian companies. Despite the slow development of the on-line market, the Internet system is already integrated with the enterprise information system of these firms, allowing a cost-effective collection of market information, and communication with target audiences. The corporate web site is successfully used by the majority of respondent companies to promote the company and its activity, and, in a smaller measure, to sell online products and/or services.

The size and the activity profile of the firm influences some of the aspects related to the implementation, functionality and interactivity of the web site. The small companies are actively using the corporate web site to compete successfully with larger organisations, which do not have yet the necessary incentives to fully exploit the Internet capabilities. In the context of a poorly developed online market, they prefer to use the traditional channels of data collection, promotion, selling and communications, treating the Internet as a secondary channel.

The IT-related firms do have the necessary expertise and motivation to intensively use the corporate web-site. The often provide specialised services over the Internet, which requires a fully functional and highly interactive web site. On the other hand, the manufacturing firms are slow to adopt this new Information channel, because of a business environment without many online ramifications. The poor development of the Romanian online market, many of the commercial firms do not fully invest in the interactive capabilities of the corporate web site.

The present study has a number of limitations: the sample size is relatively small, and although the response rate is good, does not permit any valid generalisation of the findings. Also, the relation between the classical information system of the firm and the corporate web site needs a more in-depth exploration. Future research studies should also attempt to identify the impact of the web site implementation on the functional, architectural and organisational architecture of the enterprise information system.

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14. A DYNAMIC LEOTIEF MODEL WITH REMANUFACTURING

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Abstract

Over the last century the national economies have faced a large increas in industrialization and urbanization, involving a growing amount of waste materials discharged to environment.

The solid waste disposal problem, the decreasing of landfill sites as well as the scarcity of natural resouces which provides raw material and energy for production do create a larger demand for remanufacturing and reuse. From an eco-efficiency point of view remanufacturing has two major effects: On the one hand reduces the exploitation of natural resources that is resouce conservation effect. On the other hand by recovering and reintroducing materials or reused components which can serve in the producing new goods into the economic system, the waste disposal load can be reduced that is waste reduction effect.

The aim of this paper is to investigate of the impact of remanufacturing in the economy. In static context this phenomenon was analyzed in the literature. This paper try to generalize the classical dynamic input-output model with the mentioned activity We investigate how the remanufacturing extends the availability of non-renewable natural resources for the next generations in this inter-industry framework. We first formulate the problem that is to be examined and next we estabilish some properties of the model. We examine the balanced growth path of the extended model and compare the results to the classical Leontief model. We try to answer the question, whether the remanufacturing/reuse increases the growth possibility of an economy. By this evaluation we analyze a possible sustainable development of the economy on the basis of the product recovery management of industries.

Key words: Remanufacturing, Reuse, Input-output model, Leontief model, Sustainable Development, Balanced Growth Path, Product Recovery Management.

1. Introduction

Remanufacturing is a possible solution to recover used products. The reuse of used products could save natural resources and could contribute to the goals of sustainable development. The remanufacturing in an input-output economy was first analysed by Ferrer and Ayres (2000). They have investigated the impact of the remanufacturing in a static Leontief model. The result of their examination is that the remanufacturing may induce a higher demand for labor and all other products.

In this paper we analyse the effect of the remanufacturing in the economy, but in a dynamic context. Our aim is to investigate the dynamic Leontief model (Leontief (1986)) extended with the balance equations of the used and recoverable products. The question posed in this paper is whether the remanufacturing activities increase the growth rate of an economy or not. In order to answer to this question we apply a closed extended dynamic Leontief model.

The paper is organized as follows. In the second section we pose the extended dynamic Leontief model to be examined. The next section analyses the balanced growth path in the extended economy. We supply some sufficient condition for the existence of nonnegativity of the growth rate and the balanced growth path. In the forth section we compare the balanced growth path of the Leontief economy with remanufacturing and without it. Here we give some necessary and sufficient conditions for the cases when the growth rate of the economy with remanufacturing is higher than without it. The last section summarises the results of the paper.

2. Description of the model

The model given below is an extension of the basic open dynamic Leontief input-output model well known in the literature.

***The basic Leontief model*:**
The standard model describes the interdependence between the outputs and input requirements of all sectors of a given economy in two successive years. This relation is described by the following familiar balance equation:

$$x(t) = A_x\, x(t) + B_x\, (x(t+1) - x(t)) + z(t)$$

The augmented Leontief model:
We extend the sectors of production of the standard Leontief model with the remanufacturing sectors which reproduce the used but remanufacturable products coming from the production sectors, consumption and remanufacturing respectively. The remanufactured products have the same

performance characteristics and quality standards as new units. Both the production and the remanufacturing for its operating require inputs of goods and capital stocks.
The intersectoral flows expanded to include the generation and remanufacturing of the used, remanufacturable products are illustrated on the figure1 below:

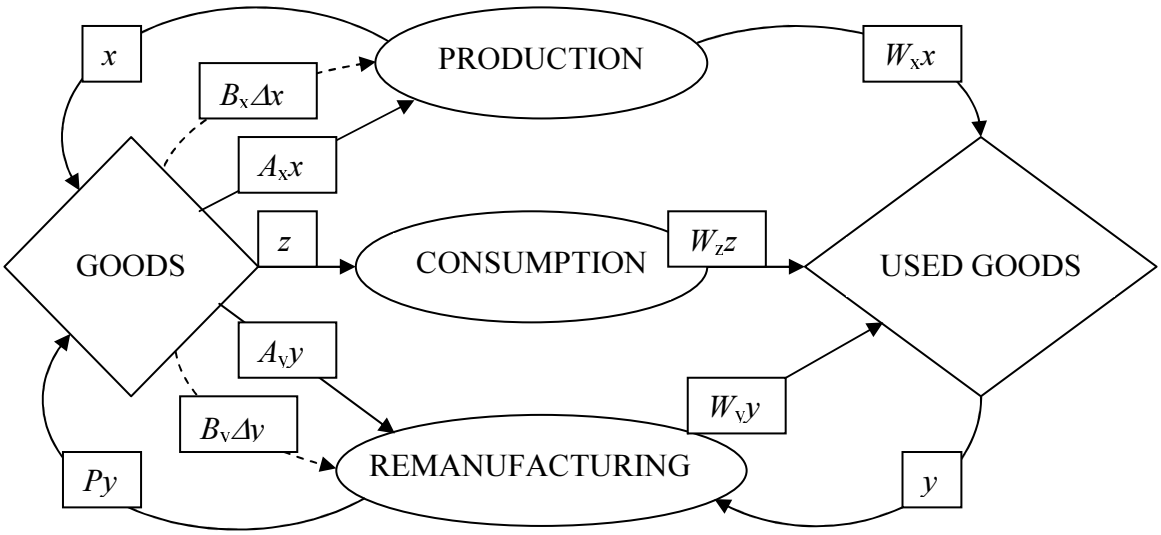

Figure 1. The material flow in the extended dynamic Leontief model

The input-output balance of the entire economy can be described by the balance equation of economic goods and balance equation of remanufacturable goods.
Suppose that there are *n* economic industries each industry producing a single economic commodity and *m* categories of used, remanufacturable products.
The balance equation of economic goods:

$$x(t) + Py(t) = A_x x(t) + B_x\left(x(t+1) - x(t)\right) + A_y y(t) + B_y\left(y(t+1) - y(t)\right) + z(t)$$

The left-hand side of the balance equation of goods represents the sum of the total output of goods of production and of the output of remanufactured goods. . The right-hand side represents the sum of the total input of goods of all activities of the economy and the consumption.

The balance equation of remanufacturable goods*:*

$$y(t) = W_x\, x(t) + W_y\, y(t) + W_z\, z(t)$$

This equation describes the balance between the output of used, remanufacturable goods issue from the production sectors, consumption and remanufacturing, and actually remanufacturable goods as inputs of remanufacturing.
Where

- $x(t)$ is the n-dimensional vector of gross industrial outputs,
- $y(t)$ is the m-dimensional vector of the used, remanufactured products
- $z(t)$ is the n-dimensional vector of final consumption demands for economic commodities,
- A_x is the $n \times n$ matrix of conventional input coefficients of production, showing the input of goods of all industries that are required to produce a unit of product,
- A_y is the $n \times m$ matrix of input coefficients of remanufacturing, showing the input of goods of all industries that are required to remanufacture a unit of used product,
- B_x is the $n \times n$ matrix of capital coefficients of production, showing the invested products to increase the output of the producing sectors by a unit,
- B_y is the $n \times m$ matrix of capital coefficients, showing the invested products to increase the input of the remanufacturing sectors by a unit,
- W_x is the $m \times n$ matrix of used-output coefficients of production, showing the output of used, remanufacturable products issue from production,

- W_y is the $m \times n$ matrix of used-output coefficients of remanufacturing, showing the output of used, remanufacturable products issue from remanufacturing,
- W_z is the $m \times n$ matrix of used-output coefficients of final consumption, showing the output of used, remanufacturable products issue from consumption,
- P is the $n \times m$ matrix of output coefficients of remanufacturing, showing the output of remanufactured products produced by the remanufacturing sectors

Since there exists such sectors of the economy like the energy sector or mining, which could not issue remanufacturable products, we could not establish a one-to-one correspondence between the output configuration of the used, remanufacturable products and actually remanufactured ones. Thus $y(t)$ could not mean the output vector of remanufacturing, it characterises only the operation level of the remanufacturing, and now coincide with the input of remanufacturing. The total output of the remanufacturing corresponding to this level of operation is exactly $P\,y(t)$.

The model described above can be reformulated as a dynamic model:

$$\begin{aligned} B_x\big(x(t+1)-x(t)\big)+B_y\big(y(t+1)-y(t)\big) &= \big(I-A_x\big)x(t)+(P-A_y)y(t)-z(t) \\ 0 &= -W_x x(t)+\big(I-W_y\big)y(t)-W_z z(t) \end{aligned},$$

or in matrix-vector form

$$\begin{bmatrix} B_x & B_y \\ 0 & 0 \end{bmatrix}\begin{bmatrix} x(t+1)-x(t) \\ y(t+1)-y(t) \end{bmatrix}=\begin{bmatrix} I-A_x & P-A_y \\ -W_x & I-W_y \end{bmatrix}\begin{bmatrix} x(t) \\ y(t) \end{bmatrix}-\begin{bmatrix} I \\ W_z \end{bmatrix}z(t).$$

Throughout this paper we assume that the consumption vector is zero $z(t) = 0$, i.e. we examine a closed dynamic augmented Leontief model. The model in this case has the form:

$$\begin{bmatrix} B_x & B_y \\ 0 & 0 \end{bmatrix}\begin{bmatrix} x(t+1)-x(t) \\ y(t+1)-y(t) \end{bmatrix}=\begin{bmatrix} I-A_x & P-A_y \\ -W_x & I-W_y \end{bmatrix}\begin{bmatrix} x(t) \\ y(t) \end{bmatrix}. \qquad (1)$$

3. Balanced growth path

In the following we study the balanced growth solution of the system (1) supposing that both production and remanufacturing increase at the same rate α.

Under these assumptions the balanced growth path for the $x(t) = x(1+\alpha)^t$ and $y(t) = y(1+\alpha)^t$ is the solution of the following generalised eigenvalue problem:

$$\alpha \cdot \begin{bmatrix} B_x & B_y \\ 0 & 0 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}=\begin{bmatrix} I-A_x & P-A_y \\ -W_x & I-W_y \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}. \qquad (2)$$

This equation can be transformed into

$$\begin{bmatrix} I & P \\ 0 & I \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}=\begin{bmatrix} A_x & A_y \\ W_x & W_y \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}+\alpha\begin{bmatrix} B_x & B_y \\ 0 & 0 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}.$$

By a simple calculation we get that $\begin{bmatrix} I & P \\ 0 & I \end{bmatrix}^{-1}=\begin{bmatrix} I & -P \\ 0 & I \end{bmatrix}$. Multiplying both sides of the former matrix equation by this inverse matrix we get

$$\begin{bmatrix} x \\ y \end{bmatrix}=\begin{bmatrix} A_x-PW_x & A_y-PW_y \\ W_x & W_y \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}+\alpha\begin{bmatrix} B_x & B_y \\ 0 & 0 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}.$$

Rearranging this equation we have

$$\alpha\begin{bmatrix} B_x & B_y \\ 0 & 0 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}=\begin{bmatrix} I & 0 \\ 0 & I \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}-\begin{bmatrix} A_x-PW_x & A_y-PW_y \\ W_x & W_y \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}. \qquad (3)$$

Remark: The eq.(3) is equivalent to the eq.(2), so that the solutions of the eq.(3) are also solutions of the eq.(2).
For further analysis it is more convenient to write the above linear system in a simpler matrix-vector form as:

$$\alpha B_q q = (I - A_q)q, \tag{4}$$

where $A_q = \begin{bmatrix} A_x - PW_x & A_y - PW_y \\ W_x & W_y \end{bmatrix}$ is the $(n+m)\times(n+m)$ input matrix, $B_q = \begin{bmatrix} B_x & B_y \\ 0 & 0 \end{bmatrix}$ is the $(n+m)\times(n+m)$ capital matrix, $q = \begin{bmatrix} x \\ y \end{bmatrix}$ is the $n+m$ - dimensional state vector.

Notation: Throughout the paper we will use the following notation. Let M be an arbitrary $n\times n$ matrix. Then $M \geq 0$ (M is nonnegative) means each entry of M is nonnegative and for nonnegative M, let $\lambda_1(M)$ denote the *Frobenius root* of M that is the nonnegative real eigenvalue of M dominant in modulus.

***Lemma* 1.** Sufficient conditions for the existence of the unique balanced growth path of the system (1):

(i) $A_x - PW_x \geq 0$ and $A_y - PW_y \geq 0$,

(ii) $\lambda_1(A_q) < 1$.

Proof. If the above conditions are fulfilled, then according to Perron-Frobenius's theorem $(I - A_q)^{-1}$ exists and it is nonnegative. Multiplying both sides of the eq.(4) by this latter nonnegative matrix we get:

$$(I - A_q)^{-1} B_q q = \frac{1}{\alpha} q. \tag{5}$$

According to Perron-Frobenius's theorem, this eigenvalue problem for the nonnegative matrix $(I - A_q)^{-1} B_q$ has a unique nonnegative solution, that is the eigenvector corresponding to the dominant eigenvalue of this matrix. Denote

$$\alpha := \frac{1}{\lambda_1((I - A_q)^{-1} B_q}. \tag{5.1}$$

Remarks:

(i) This positive real number α is the balanced growth rate of the system (1) that is the solution of the generalised eigenvalue problem (4), and the balanced output configuration q of the system (1) is the unique nonnegative eigenvector corresponding to $\lambda_1((I - A_q)^{-1} B_q)$.

(ii) The balanced growth rate α of the system (1) is not the greatest positive eigenvalue of the matrix $(I - A_q)^{-1} B_q$ but the reciprocal of it, that is the smallest positive eigenvalue corresponding to the generalised eigenvalue problem (4).

(iii) The balanced growth rate α of the system (1) is that value for which the dominant eigenvalue of the matrix $A_q + \alpha B_q$ is exactly 1, i.e. $\lambda_1(A_q + \alpha B_q) = 1$.

(iv) In economic terms the condition $A_x - PW_x \geq 0$ i.e. $A_x x \geq PW_x x$ means that the inputs of production must be greater than the outputs of remanufacturing coming from the used but remanufacturable goods of production. In other words, it is not allowed to remanufacture more products in a production process than this process uses it up.

4. Comparison of the closed standard dynamic Leontief model with the augmented dynamic Leontief model

We try to answer the question, whether an economy with remanufacturing realises a greater growth than without it. We have found that if certain conditions are fulfilled, the augmented dynamic model could reach a greater growth rate than the standard one.
We search conditions for that, the growth rate corresponding to the unique balanced growth path of the augmented model (1) when will be greater than the growth rate corresponding to the unique balanced growth path of the standard closed model

$$x(t) = A_x\, x(t) + B_x\, (x(t+1) - x(t)). \tag{6}$$

Let α_1 and x_1 be the growth rate and the output configuration corresponding to the balanced growth path of the standard model

$$(I - A_x)x_1 = \alpha_1 B_x x_1. \tag{7}$$

This balanced growth path (x_1, α_1) will not satisfy the systems of equations of the augmented model (1), because for $y = 0$, $W_x x \neq 0$, but will satisfy the systems of inequality

$$\begin{bmatrix} I - A_x & P - A_y \\ W_x & W_y - I \end{bmatrix} \begin{bmatrix} x(t) \\ y(t) \end{bmatrix} \geq \begin{bmatrix} B_x & B_y \\ 0 & 0 \end{bmatrix} \begin{bmatrix} x(t+1) - x(t) \\ y(t+1) - y(t) \end{bmatrix} \tag{8}$$

or

$$Qq(t) \geq B\, (q(t+1) - q(t)). \tag{8.1}$$

Naturally a nonnegative production will issue a nonnegative quantity of remanufacturable goods, i.e. $W_x x \geq 0$.

***Remark* 1.**

In the following we give such a balanced growth path of system (8) of which rate of growth is greater than the rate of growth α_1 of the standard model. (Denote α_2 this growth rate described previously.) We could find such a growth path of system (8), only if certain sufficient conditions are fulfilled. As it is known (Dorfman, 1958) the unique rate of balanced growth α defined by the equation (5a) of the system (1) is the greatest rate of growth of which the system (8) is capable, that is greater than the growth rate α_2 described above. From the previous reasoning it follows that if that certain sufficient conditions are fulfilled, then the unique rate of balanced growth α of the augmented model will be greater than the unique rate of balanced growth α_1 of the standard model.
We prove first the following Lemma 2:

***Lemma* 2.**

Let R be the net output matrix, S be the capital matrix and q_1 and q_2 be two nonnegative state vectors such that

$$R\, q_1 = R\, q_2 \geq 0 \text{ and } S\, q_1 \geq Sq_2 \geq 0.$$

Let α_1 and α_2 be nonnegative real numbers such that

$$\alpha_1 := \max(\alpha \mid R\, q_1 - \alpha S\, q_1 \geq 0\ ),$$
$$\alpha_2 := \max(\alpha \mid R\, q_2 - \alpha S\, q_2 \geq 0\ ).$$

Then the following holds

$$\alpha_1 \leq \alpha_2.$$

***Remark* 2.**

We consider two balanced growth paths of the system (8) with growth rates α_1 and α_2 respectively, and production configuration q_1 and q_2 respectively. We choose these two balanced growth paths of the system (8) such that on the one hand the net outputs corresponding to the production configuration q_1 and q_2 respectively are equal i.e.
$R\, q_1 = R\, q_2 \geq 0$. On the other hand the capital requirements corresponding to the production configuration q_1 is greater than the capital requirements corresponding to the production configuration q_2, i.e. $S\, q_1 \geq Sq_2$. Under these assumptions the balanced growth rate α_2 will be greater than the balanced growth rate α_1.

***Remark* 3.**

The nonnegative real number α_1 defined above exists and equal to

$$\alpha_1 = \min_i \left(\frac{R_i q_1}{S_i q_1} \middle| S_i q_1 \neq 0 \right),$$

since $S\,q_1 \neq 0$ then there exists at least one row i of the matrix S such that $S_i\,q_1 > 0$.
Proof.
Let us suppose that $\alpha_1 > \alpha_2$. Then the inequality $R\,q_2 - \alpha_1 S\,q_2 \geq 0$ could not be fulfilled because of the maximal property of α_2. This implies that there exists a row i of the matrix R such that $R_i\,q_2 < \alpha_1 S_i\,q_2$. Using the Lemma's assumptions $R_i\,q_2 = R_i\,q_1$ and $\alpha_1 S_i\,q_2 \leq \alpha_1 S_i\,q_1$ it follows that $R_i\,q_1 < \alpha_1 S_i\,q_1$ which is inconsistent with the definition of α_1.

***Theorem* 1.**
If $(B_x(I - A_x)^{-1}(P - A_y) - B_y)\,(I - W_y)^{-1}\,W_x \geq 0$ then the balanced growth rate α of the augmented model will be greater than the balanced growth rate α_1 of the standard model.
Proof.
Let $R := \begin{bmatrix} I - A_x & P - A_y \end{bmatrix}$ and $S := \begin{bmatrix} B_x & B_y \end{bmatrix}$ be $n\times(n+m)$ - dimensional matrices

Let us consider that case for Lemma 2 where $q_1 = \begin{bmatrix} x_1 \\ 0 \end{bmatrix}$ and $q_2 = \begin{bmatrix} x_2 \\ y_2 \end{bmatrix}$. x_1 is the output configuration corresponding to the balanced growth path of the standard model (7), that is this q_1 state vector will satisfy exactly the equality in the system of inequalities (8) and α_1 is the unique rate of balanced growth of the standard model. This α_1 satisfies the constraint of Lemma2 i.e. $\alpha_1 := \max(\alpha \mid R\,q_1 - \alpha S\,q_1 \geq 0)$. Furthermore we choose y_2 such that it satisfies exactly the equality in the second row of the system of inequalities (8), that is

$$W_x x_2 = (I - W_y) y_2$$

If $\lambda_1(W_y) < 1$ according to Perron-Frobenius's theorem $(I - W_y)^{-1}$ exists and it is nonnegative. Expressing y_2 from the above equation we have:

$$y_2 = (I - W_y)^{-1}\,W_x x_2\,. \tag{9}$$

The obtained y_2 is nonnegative according to the previous reasoning. We choose the output configuration x_2 of the model such that the net outputs corresponding to the output configuration q_1 and q_2 respectively be equal i.e. $R\,q_1 = R\,q_2$, that is

$$(I - A_x)x_1 = (I - A_x)x_2 + (P - A_y)\,y_2.$$

By using the equation (9) for y_2 in the above equality we get

$$x_1 = (I - A_x)^{-1}\,(I - A_x + (P - A_y)\,(I - W_y)^{-1}\,Wx)x_2. \tag{10}$$

Such a nonnegative x_2 uniquely exists if the conditions of Proposition 2 are fulfilled and then

$$x_2 = (I - A_x + (P - A_y)\,(I - W_y)^{-1}\,Wx)^{-1}(I - A_x)x_1.$$

By choosing x_2 and y_2 as described previously, α_2 is the growth rate corresponding to that balanced growth path which satisfies the requirement $\alpha_2 := \max(\alpha \mid R\,q_2 - \alpha S\,q_2 \geq 0)$.
Obviously on the one hand α_1, q_1 satisfy the inequality $Rq_1 - \alpha_1 S\,q_1 \geq 0$ if and only if α_1, q_1 satisfy the inequality $Qq_1 - \alpha_1 Bq_1 \geq 0$, and on the other hand α_2, q_2 satisfy the inequality $Rq_2 - \alpha_2 S\,q_2 \geq 0$ if and only if α_2, q_2 satisfy the inequality $Qq_2 - \alpha_2 B\,q_2 \geq 0$.
In the following we establish under which condition $Sq_1 - Sq_2 \geq 0$. In the evaluations below, we use the equation (9) and equation (10):

$$S\,q_1 = B_x x_1 = B_x(I - A_x)^{-1}\,(I - A_x + (P - A_y)\,(I - W_y)^{-1}\,Wx)x_2 =$$

$$= B_x x_2 + B_x\,(P - A_y)\,(I - W_y)^{-1}\,Wx)x_2\,,$$

$$Sq_2 = B_x x_2 + B_y\,y_2 = B_x\,x_2 + B_y(I - W_y)^{-1}\,Wx)x_2\,.$$

Taking the difference of the above equations we get:

$$S\,q_1 - Sq_2 = (B_x(I - A_x)^{-1}(P - A_y) - B_y)\,(I - W_y)^{-1}\,W_x\,x_2.$$

Using this difference we can compare the capital stock allocations of the standard model and the augmented model, corresponding to the same net output configurations.
This difference is nonnegative if the following inequality holds:

$$(B_x(I - A_x)^{-1}(P - A_y) - B_y)\,(I - W_y)^{-1}\,W_x \geq 0. \qquad (11)$$

The economic content of this sufficient condition is that the capital requirement of the standard model is greater than of the augmented one, supposing the same net outputs for both models.
Then we conclude that if this sufficient condition (11) is fulfilled, then the conditions formulated in Lemma 2 are also satisfied for q_1, q_2, S and R defined above. According to this Lemma 2 we have that $\alpha_1 \leq \alpha_2$ and by applying the argumentation of the Remark1, we conclude that the unique rate of balanced growth α of the augmented model will be greater than the unique rate of balanced growth α_1 of the standard model, which was to be proved.

5. Conclusion

In this paper we have investigated the effect of remanufacturing activites on the growth of an economy in a closed dynamic Leontief model. To fulfill the examination, we have extended the classical dynamic input-output model with the balance equation of the used, but recoverable products.
Summarising the results of the paper we can say that the impact of the remanufacturing in an economy can be analysed using the input-output model in a dynamic context and the usual investigation methods can be applied to examine the remanufacturing activities. We have supplied a sufficient condition concerning that the economy with remanufacturing when will increase faster than the economy without it.
In a next research we can introduce the consumption in our investigations, which means an analysis of an open dynamic Leontief model with remanufacturing. The question to be answered in this augmented model is that could the economy be controlled by the consumption level. The balanced growth path could also be investigated in this model. A second direction of our examinations could be to analyse the effect of the remanufacturing on the exploatation of natural resources. The question to be answerd is whether the remanufacturing reduces the use of natural resources. The answer to these questions is left to be evaluated in the further papers.

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***Proposition* 2.** Denote $W := (I - W_y)^{-1}W_x$. Sufficient conditions for the existence of nonnegative $(I - A_x + (P - A_yW))^{-1}$:
(i) $A_x - PW_x \geq 0$ and $A_y - PW_y \geq 0$
(ii) $\lambda_1(A_x - (P - A_y)W) < 1$

Proof. (i) The matrix $A_x - (P - A_y)W$ is nonnegative if and only if
$A_x + (A_y - P)\,(I - W_y)^{-1}\,W_x \geq 0$ By equivalent transformations we get
$A_x + (A_y - PW_y - P(I - W_y))(I - W_y)^{-1}\,W_x \geq 0$ equivalent to
$A_x - PW_x + (A_y - PW_y)\,(I - W_y)^{-1}\,W_x \geq 0$. This inequality is fulfilled if
$A_x - PW_x \geq 0$ and $A_y - PW_y \geq 0$.
(ii) The nonnegative matrix $A_x - (P - A_y)$ has nonnegative Leontief-inverse according to Perron-Frobenius's theorem if and only if $\lambda_1(A_x - (P - A_y)W) < 1$.

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15. THE IMPACT OF ECONOMIC DEVELOPMENT ON EACH OF THE THREE SECTORS

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Abstract

Due to the industrial development the structure of the economic changed hugely in the last century. Although the role of agriculture is reducing, which is the natural consequence of the social and economical development; it still remains one of the significant industries of the economy. Originally, the main part of the economy and the employment belonged to the agriculture but now, in a developed country this sector represents below 5 percent.

Analysing these questions and following the share of GDP and employment as indicators in the agrarian sector, a similar pattern can be seen in connection with the level of development. Firstly, nearly the same course could be observed in every country but not in the same time. Secondly, countries divided into groups where different development tendencies and speeds can be seen.

This study focuses on finding coherence between the level of development and the share of GDP and employment among industries. By observing this changing process, the main questions are (1) What kind of steps required? (2) When these changes had happened in different countries? (3) How long did this transformation take? (4) Why the central-eastern countries created a unique development way? (5) In these countries the GDP growth is much higher than in the EU average, is it enough to help this process to reach the EU level as soon as possible? (6) And whether the unhealthy development path will be effective enough in the future to speed up the closing procedure without causing more structural problems later?

A statistical program named SPSS was used to create three dimension figures, showing the postponement and changing in the economic development among countries in the last century.

Key words: ***Economic Growth, Agrarian sector, EU candidate countries, Share of GDP***

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States of Development

Although the role of agriculture is reducing, which is the natural consequence of the social and economical development, it still remains one of the significant sectors of the economy for the Eastern-European Countries. But it is also the key sector for every developed country.
It is important to observe the changes within sectors; what kind of steps required and when these changes had happened and how long will the transformation take?
Analyzing these questions the share of GDP and employment were used as indicators.

But right before the observation the national standard separation of the economy can be clarified. Beside crops and livestock, hunting, forestry and fishing also belongs to the sector of agriculture, while industry

consists mining, food industry, constructions, ect. The third sector includes transport, services, financial activities, telecommunication, state services, ect.

In the transformation process of an economy, the predominance of the agriculture is one of the significant sign right before the economical development due to the fact that the development leaves its profound marks on the agrarian sector. It can be seen in the following comparison includes different "states of development" by Ihring and Kornai, which indicates the process of the economical development:

1. The number of total population starts to reduce in a developed country.
2. These decreases also can observe in the agrarian sector but not as rapid; otherwise, it is slowing as approaching the need of minimal technical requirements (around 5 % of total employment). To compare with an undeveloped country, both numbers are still increasing.
3. The number of corporations reducing, while the used land and infrastructure per one corporation becoming larger, which shows the pattern of integration when the efficiency and income is growing. In an undeveloped country, both changes happen inverse.
4. The direction line of development spreading the intensive use of capital, saving labor workers and instruments while the undeveloped countries developing intensive use of manual workers.
5. By increasing the income, the demand of agrarian products increasing (not linearly) but more changes can observe within the structure of products forward to the higher added ones.

Consequently, similar occurrences seem to be happened in the world of economy. But to know exactly the reasons of changes, deeper research is needed.

Agriculture versus Industry

The share of the three sectors had changed significantly during the 20th century, moreover, this changes were spectacular in connection with industry and agriculture.

In a longer period the general tendency is that the GDP share of the agrarian sector is reducing significantly. The same happens in case of the share of employment but the decline is not as huge. The reason for these slower changes reflects that the productivity of agriculture increased slower than the average national productivity in the last two centuries.

In most of developed countries the GDP share of the agrarian sector is below 5 percent, but in a middle developed country it is less than 20 percent.

Due to the development the declined importance of agriculture ensures as necessarily. This tendency has more reasons: firstly, the different way of development in the industries, secondly, the different reaction time of sectors for the changed circumstances, thirdly and mostly, the need for agrarian products fulfill more rapidly in a higher developed country than the non agrarian ones.

In the process of economical growth, the share of industry follows regular way at expenses of agriculture until reaching relatively high level of economical development. One important condition of the rapid economical growth is the dynamical increases of the productivity of agriculture, moreover, a quick structural changes a favor for the industry could result faster temporary productivity in the agrarian sector than in the industry. Else, the process of growth could get stuck.

Evidently, most of instruments, machines, seeds, artificial fertilizer, chemicals, ect. used by the agrarian sector have industrial origin and the development of these also belong to that sector. Thanks to take over these assets, they can help to improve agriculture while inversely, the agrarian sector hardly gives any technique to the industry.

Industry versus Third Sector

After the Second World War, in a developed country the importance of the Third Sector was increased significantly due to the fact that more and more employees moved to work in it from the Industry. As for the consequence, the importance of the First Sector was decreased a favoured to the other two (in two steps). But after a while the Industry was the one which gave the employees for the Third Sector, which was the effect of the changing within the Industry in the 70's. The role of the Industry became less important and added less to the total GDP.

The higher is the GDP per person in a country, the higher is the rate of non-agrarian and industry workers. Share in gross domestic output, investment, exports, employment all suffer diminution.

Structural changes in the economy

There is different structural development inside a country due to the unlike economic situation so it does not worth creating an average indicator. But to draw the tendency of structural changes of countries, the postponement can be observed.

During the last century these changes had happened in a different manner so only the three significant periods will be observed in this research:

1. The changes in the 60' and early 70's
2. The changes in the 90's in the Eastern European countries
3. The changes in the period of the Recession at the end of the century

Structural changes in the World until the middle 70's

In the 17th and 18th century, the Economics Growth was below 1 percent. However, in the following century and also in the beginning of the 20th, this indicator was 2,5 percent.

In the last century, spectacular changes had happened which were based on the new technologies, new resources and later the incredible development with and in the informatics.

But the huge changing had happened after the Second World War, when countries in Europe (in a different manner) started to rebuild it's industry and tried to settle down as self-supporting. But while in Eastern-Europe, in the 60's, this growth mainly based on the amount of capital and labour work (and reached more than 6 percent of GDP growth) until in the Western countries growing number of the Economic Growth (around 5 percent but remained steady) primary based on the increasing within the productivity.

Generally, in the period of 1960-1975 another structural changes could be observed, the increasing of the Economic Growth no more based on the newly discovered natural resources or the growing amount of investments but on the new technologies and informatics. However, this produced new limits for the growth: in the middle of the 70's, the amount of unsold products reflects on new problems.

The structural changes in the 60's had fundamental effects for the following path of the development. Nevertheless, in this period the developed countries reached the "final development state" while in the Eastern countries only the previous one.

In table 1, the changes in this period can be observed with several key indicators from different countries.

Table 1. **Several countries GDP shares within the three sectors between 1960-75**

%	Agriculture			Industry			Third Sector		
	1960	1970	1975	1960	1970	1975	1960	1970	1975
More developed countries									
England	*4*	*2*	*3*	*37*	*32*	*30*	*59*	*66*	*67*
Western-Germany	6	3	3	47	46	43	47	51	54
France	*9*	*6*	*5*	*40*	*31*	*30*	*51*	*63*	*65*
Netherlands	*9*	*6*	*5*	*38*	*32*	*29*	*53*	*62*	*66*
Austria	*11*	*7*	*5*	*41*	*38*	*34*	*48*	*55*	*61*
Italy	*13*	*9*	*8*	*34*	*34*	*34*	*53*	*57*	*58*
Spain	*22*	*11*	*9*	*29*	*29*	*30*	*49*	*60*	*61*
Greece	*20*	*16*	*17*	*17*	*19*	*21*	*63*	*65*	*62*
Eastern countries									
Eastern-Germany	17	12	10	58	63	64	25	25	26
Czechoslovakia	17	12	10	58	63	64	25	25	26
Soviet Union	20	22	17	52	51	53	28	27	30
Hungary	*23*	*18*	*17*	*59*	*43*	*47*	*18*	*39*	*36*
Poland	26	17	15	47	55	59	27	28	26

Bulgaria	32	23	22	46	49	51	22	28	27
Romania	33	19	16	44	58	57	23	23	27
Other countries									
USA	*4*	*3*	*3*	*34*	*30*	*28*	*62*	*67*	*69*
Brasilia	*18*	*12*	*12*	*19*	*21*	*23*	*63*	*67*	*65*
South-Korea	*37*	*28*	*25*	*17*	*25*	*30*	*46*	*47*	*45*
India	*47*	*43*	*43*	*15*	*15*	*16*	*38*	*42*	*41*

Sources: UN Statistical Yearbook, 1962, 1976

In the Western-European countries, the role of the Third Sector took shape in the 50's and for the 60's, it had already represented around 60 percent of the GDP, while these times in the Eastern countries, it had less importance, below 30 percent. This area would have reached this proportion only in the 90's. So the backlog was about 20 years at that time.

A period changes was sensible in the process of economical development in the early 60's which effected basically the way of further improvement in the following part of the last century. The economic changes also influence the developed countries but not in the same way. At this time the developed countries had already reached the "last state of development" in connection with the structure of economy, meanwhile in the middle developed countries this last period had just started. In the 70's:

- In a developed country, the overweight of the third sector increased dominantly (both GDP and employment is over 60%) can be seen;
- In a middle developed country, these same indicators are around 45%;
- In the central-eastern countries, it was only 30% at this time and from the 60's, hardly any changes had happened toward to the Third Sector.

By observing data it can be seen that in the 70's in the Eastern countries the role of the Industry started to reduce or at least the increasing of it started to slow but still the fluctuation between the agriculture-industry had happened. While in India, the transformation had just started at this time and still the agrarian sector played the most important part of the economy with more than 40 percent of the GDP.

Table 2. **Share of employment in several countries within the three sectors between 1960-75**

%	**Agriculture**			**Industry**			**Third Sector**		
	1960	**1970**	**1975**	**1960**	**1970**	**1975**	**1960**	**1970**	**1975**
Developed countries									
England	***3***	***2***	***2***	***43***	***40***	***36***	***54***	***58***	***62***
Western-Germany	***14***	***9***	***8***	***40***	***41***	***41***	***46***	***50***	***51***
France	***22***	***14***	***12***	***30***	***28***	***29***	***48***	***58***	***59***
Netherlands	***12***	***7***	***7***	***32***	***27***	***25***	***56***	***66***	***68***
Austria	***6***	***2***	***2***	***41***	***38***	***38***	***53***	***60***	***60***
Italy	***33***	***20***	***17***	***27***	***33***	***33***	***40***	***47***	***50***
Spain	***36***	***30***	***26***	***26***	***28***	***28***	***38***	***42***	***46***
Eastern-European countries									
Eastern-Germany	6	4	4	46	46	46	48	50	50
Czechoslovakia	26	18	16	37	38	39	37	44	45
Soviet Union	35	25	23	24	27	27	41	48	50
Hungary	***40***	***26***	***20***	***28***	***36***	***38***	***32***	***38***	***42***
Poland	...	35	32	...	28	28	...	37	40
Romania	60	50	42	16	23	28	24	27	30

Other Countries									
USA	***8***	***4***	***4***	***32***	***26***	***25***	***60***	***70***	***71***
Brasilia	*54*	*44*	*38*	*18*	*22*	24	*28*	*34*	*38*
South-Korea	*63*	*51*	*47*	*9*	*14*	*15*	*28*	*35*	*38*

... no data available
Source: UN Statistical Yearbook, 1962, 1976

The same structure and process can be seen in case of observing data of the share of employment in the three sectors in the same period. Again the Third Sector had the more employees in the developed countries (Table 2.).

As it can be seen the rate of employment in the agrarian sector is (nearly) always higher than the rate of GDP in the same sector, which is the natural consequence of the lower productivity in the agriculture. (Only in the most developed country it is not true, but the difference is mainly 1% between them). However, if the difference between these two indicators is relatively significant it means that concealed unemployment should be existed in it. That is the case in the Eastern European countries.
About the middle developed countries the same tendency can be seen: the rate of employment in the agrarian sector consists and screens unemployment within the agriculture. This base (and moreover, the fluctuation of it) will be the key of the development in the future.

Another interesting factor can be observed in the Eastern European countries: in the early 70's, new tendency had slightly started. The increasing of the Third Sector was supported by not only from the Industry but also from the Agrarian Sector at the same time, but not dominantly. Which means that one original step is missing: the fluctuation from the agriculture to the industry, which not healthy structural changes accelerated in the early 90's and would (and still will) cause more problems later.

Structural changes in the 90's
Most of the Eastern-European country stepped into the path of intensive and dynamic economic growth in the 70', which based on the industrial development.
But after the early 90's when the political changes had huge impact to the whole economy a unique development way can be noticed in this region. The reducing of agrarian and industrial sector happen in the same time toward to the third sector and the main problem was that it happened (and in some places still happens) too quickly. This causes unhealthy development pattern because the reducing of the agrarian sector is a natural effect of the development, which must not separate from the industrial support. The normal process of these changes is that due to new technologies, less manual workers are needed in the agriculture because machines can replace them. The free workers can find job in the industrial sector. But not in case of these Eastern-European countries. Later, in the next step, as more income is disposal for the population, the third sector starts to gain ground and the employers start to move there. This scenario rewrote in this region as one step is missing.

Meanwhile in the 70's the lag of these countries looked to be reduced. But this process could be seen until the early 90's and the development stopped or turned into negative. Thanks to that, the lag became bigger than it was, according to experts now it is more than 25 years.

Furthermore, two countries were observed more detailed in this period: Hungary and Romania in order to see the differences and the backlog between them (Table 3.).

Table 3. **GDP in the agrarian sector in Hungary and Romania in the 90's**

	1990	**1995**	**1998**	**2000**
Hungary	11,2	6,8	5,7	4,3
Romania	20,3	20,6	14,7	12,8

Source: Agriculture Yearbook 2002.

According to the data it can be seen that the structural changes started later in case of Romania and moreover, it looks to be slower than in Hungary. The agrarian sector still play important role in both

countries but in Romania more changes will be expected and surely the share of GDP will sink more. In Hungary these figures should be observed in the 80's which means that the backlog between these two countries in case of the structural changes is around ten years. But in Romania, it is favourable that the changing process is looks to be slower and without one missing step: the fluctuation from the agrarian sector firstly to the industry realized.

Structural changes in the period of Recession

The following table shows the structural situation in two years: 1997, right before the decline of the whole economy and 2001, when some effects can be observed.

Now these countries once again managed to step into the path of economic growth and try to facilitate this accession process. The GDP growth is two or three times bigger than the EU average, which needs to be stabilized to fulfill the EU requirements (for example Maastrict). Add to the fact that the decline of the whole economy, which effect not only USA and EU but the whole world also effected these Eastern countries but not in the same volume.

Table 4. **Share of GDP per sectors**

%	1997			2001		
	Agri-culture	**Industry**	**Third Sector**	**Agri-culture**	**Industry**	**Third Sector**
Czech Republic	4,4	42,1	53,5	4,2	40,1	55,7
Estonia	7,9	29,3	62,8	5,8	28,7	65,5
Hungary	5,9	32,7	61,4	4,3	33,3	62,4
Latvia	5,6	32,2	62,2	4,7	24,9	70,4
Lithuania	11,7	32,9	55,4	7,0	34,5	58,5
Poland	5,5	37,2	57,3	3,4	32,9	63,7
Slovakia	5,6	34,7	59,7	4,6	32,7	62,7
Slovenia	4,2	37,4	58,4	3,1	36,9	60,0
Romania	15	36,6	48,3	12,8	36,3	50,9
Bulgaria	13,4	32,4	54,2	13,7	28,5	57,8
EU average	***2,3***	***27,5***	***70,2***	***2,1***	***27,4***	***70,5***
United Kingdom	***1,8***	***30,9***	***67,3***	***0,9***	***26,5***	***72,6***
Germany	***1,3***	***32,1***	***66,6***	***1,2***	***29,1***	***71,7***
USA	***1,5***	***27,3***	***71,2***	***1,3***	***26,4***	***72,3***

Sources: Szabó, László: Situation after negotiation of EU accession.

Observing Table 4. it can be seen that still there is significant difference between the EU average (and USA) and the Eastern countries but favorable direction can be seen toward to the second observed year, which means that the decline did not stop the structural changes but surely slowed it a little.

However, difference means lag; this structure could have observed in the EU in the early 80's, when the industry played the main role.
Other differences can be observed between the EU candidate countries and Romania and Bulgaria, where the weight of the agrarian sector is still important and supposed to be the structural changes started later. But it does not mean that it is worse: according to this figures, the changing process is slower as it was in the candidate Central-European countries which might effect less problems later within the agrarian sector in these two countries.

But how long will this process take? Nowadays in a developed country, the share of agrarian sector does not sink below 3% (but that is an average number, based on the natural endowments; for example in Luxembourg it is only 0,4%). But in many cases it is hard to divide the borders of the agrarian sector with other industries like food industry, transportation, production industry (called agrobusiness), which is connected with agriculture strongly, the share of GDP and employment could reach 20-30 percent. So

overall, agrarian sector represents more from an economy than the data shows; it still has an important role.
It is clear that in these eastern countries in the last six or more years, still the widening and modernization of industrial capacities is the leading path of development. Moreover, the restructuring of the "destroyed" agrarian sector in parallel also plays significant effect.
In the following observation the relation of the EU candidate countries was analyzed according to the share of GDP based on the data of table one. A statistical program named SPSS was used to create three dimension figures, showing the economic development (Figure 1 and 2).

Figure 1.

Share of GDP per sectors in 1997

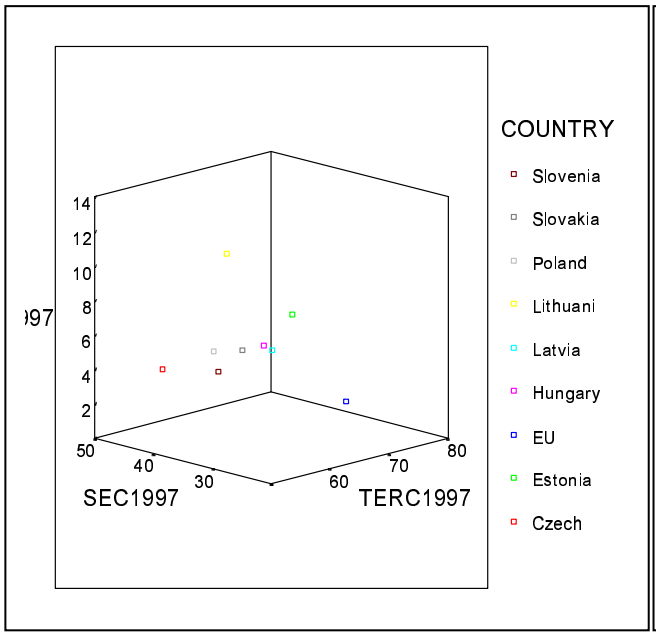
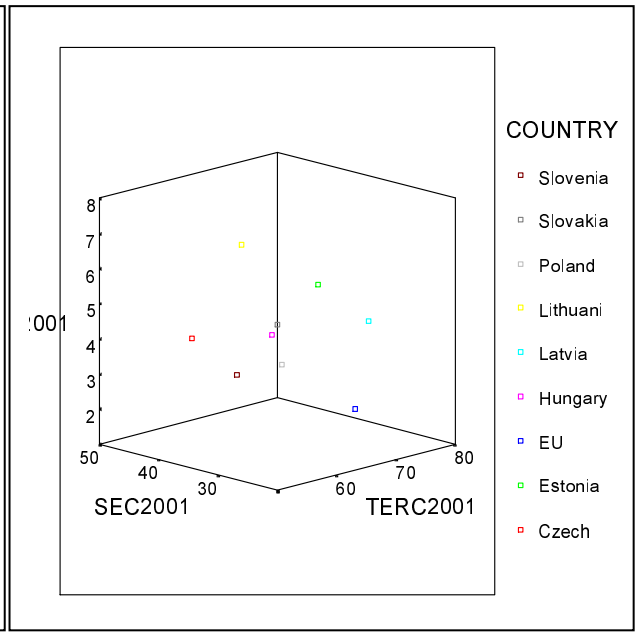


Figure 2.

Share of GDP per sectors in 2001



Source: own calculations

In 1997 the countries looked nearly in the similar development state and only Lithuania, Czech Republic, Estonia and EU not belong to the group. In the Baltic countries there is still high agriculture influence while Czech Republic is rather an industrial type of country so the expected results was got. But surprisingly in 2001 the dots spread more and real groups did not divide. It means that although every country developed, they followed a different path. Different development tendencies and speeds can be seen.
Latvia made bigger jump such as **Slovakia**, both of them moved left to right in the figure. It means that the direction of changes happened only between industry and third sector, which is the last and healthy step to reach the developed state. **Lithuania** and **Estonia** moved top to the bottom, this changes describes the first step of the development when the agrarian sector reduced in favor of industry. Meanwhile **Poland** moved across to the bottom (closest to EU), this represents the unique development way when the direction of changes happens together. Both agriculture and industry nourishes the third sector at the same time.
Unmentioned countries did not change significantly in the observing years (they have already been a little closer to EU) which can be explained with the fact that approaching the developed situation, the changes slowing down. But it is important to note that in the moving countries the GDP growth rate was much higher than the other ones, which gave them more opportunity to influence the changes. But lag is still there in every country.

Summary

The GDP share of the agrarian sector describes the development level of a country. The ideal data is less than 5 percent but to reach that there is a natural development process.

Forming and increasing the leading role of the third sector in a developed country but it could not separate from formation of other two sectors. Firstly, industry took shape at cost of agriculture as for needing human and financial resources and after that, the industry gave more resources to the third sector. Nearly same pattern has happened in every country but not in the same time.
Due to the political changes in the end of the century, in the Eastern countries created an unique development way. Reducing of agrarian and industrial sector happening in the same time toward to the third sector, which is not an unhealthy development pattern.
In these countries the GDP growth is much higher than in the EU average, which one hand help this process but needs to be stabilized to reach the EU level as soon as possible. Otherwise, it is still a question mark whether the unhealthy development path will be effective enough in the future to speed up the closing procedure and it will not cause more structural problems later. Fulfilling key data is not enough.

From the 80's, the importance of effective and maintenance economics growth without exhaust all natural resources or damage irreversible the surfaces increased hugely. But firstly only in the developed country tried to solve these problems because in Eastern Europe the countries faced with much serious ones, which effected the delay.
But now, steps also required from the Region in this filed.

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16. RESPONSIBILITIES IN AGENT-BASED TEAMWORK

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Abstract

Responsibilities are an important component of teamwork. When an Agent joined a team organization, it must obey constrains organizational rules. Organizational rules are constrains conditions and action criterions every member of the team must obey. Organizational rules are also the

coordination and cooperation rules. When a team member has achieved his goals, he has the responsibility to communicate his commander this information; when he find one goal cannot be achieved or has been achieved he has the responsibility to communicate his teammate this information.

Flexible communication among team member is the most effective way to avoid team miscoordination.

1. Sistemele multi-agent - structură, dimensiuni, funcționalitate

Un agent software este un agent care execută o serie de sarcini independente în favoarea utilizatorului fără intervenția explicită a acestuia.

Agentul este o entitate complexă care are o serie de proprietăți prin care se deosebeşte net de un singur program:

- *Încredere – agentul execută ceea ce este programat să execute*
- *Personalitate – agentul poate învăța sau poate fi învățat ceea ce trebuie să facă*
- *Autonomie – agentul în mare măsura ia decizii degrevând sarcina utilizatorului*

Agentul este o unitate de procesare care operează în paralel cu alți agenți, un sistem complet de procesare a informației. Este format din mecanisme de emisie recepție mesaje, memorie (pentru menținerea unor stări), un procesor care analizează evenimentele de tip input şi execută o serie de acțiuni interacționând cu ceilalți agenți.

***Structura** unui agent depinde de modelul care are la bază implementarea sa.*

1. *Modelul MVC (Model View Controller)*
   Un agent este modelat având în vedere trei elemente funcționale:
   - *Model – defineşte componenta abstractă a agentului (nucleul său funcțional)*
   - *View – defineşte perceperea comportamentului agentului de către exterior*
   - *Controller – defineşte perceperea comportamentului agentului în momentul în care acesta recepționează mesajele din exteriorul său*
2. *Modelul PAC (Presentation Abstraction Control)*
   Agentul PAC are următoarea structură:
   - *Presentation – modul în care agentul percepe activitățile de input şi output*
   - *Abstraction – nucleul funcțional al agentului*
   - *Control – partea care exprimă dependențele: are ca sarcină gestionarea mecanismului de comunicare dintre agenți precum şi exprimarea relațiilor de dependență ce există între elementele Abstract şi Presentation.*
3. *Modelul CNUCE*
   Agentul este format din;
   - *Collection – nucleu funcțional care tratează activitățile de input*
   - *Abstraction – nucleu funcțional care tratează activitățile de output*
   - *Measure – modulează interacțiunea (interfața) agent – utilizator din punct de vedere al activităților de input*
   - *Presentation – modulează interacțiunea (interfața) agent – utilizator din punct de vedere al activităților de output*
4. *Modelul YORK*
   Agentul este format din două parți:
   - *Presentation*
   - *Comportarea sa internă*

În concluzie:

- MVC şi CNUCE au la bază despărțirea activităților de input şi output

- PAC şi YORK se concentrează asupra noțiunilor de Presentation şi View

***Dimensiuni** ale agenților:*

- *<u>Noțiunea de nivel de abstractizare</u> exprimă transformările pe care funcțiile de interpretare şi manipulare le exercită asupra informației. Secvența de transformare a intrării defineşte funcția de interpretare. Informația internă este transformată pentru a fi cunoscută utilizatorului printr-o secvență de mesaje de ieşire; cuprinde şi mulțimea de posibilități de reprezentare pe care sistemul le suportă.*

Informațiile dobândite de agenți sunt transformate de un grup de agenți înainte de a ajunge la nucleul funcțional al sistemului. Paşii succesivi ai acestor transformări ale ieşirilor şi intrărilor duc la definirea conceptului de nivel de abstractizare.

- *Contextul – capacitatea unui sistem de a interpreta şi manipula informații variază dinamic în funcție de variabilele considerate într-un context dat. Variabilele contextuale formează un set de parametrii interni de stare folosiți de procesele de reprezentare pentru a controla interpretarea şi manipularea informației.*

- *Fuziunea – procesul de combinare a unor părți de informații cu scopul de a forma o nouă informație*

- *Fisiunea – procesul de decompoziție*

- *Paralelismul – în modelele multi-agent timpul este analizat din punct de vedere al funcțiilor de interpretare şi manipulare a informației. Un agent este o unitate de procesare care poate executa un set de sarcini în paralel cu activitatea altor agenți.*

Procesul de alocare a resurselor este o activitate complexă care se realizează în mai mulți paşi şi depinde de o serie de factori.

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Sistemele multi-agent

- Sunt folosite în proiectarea unor sisteme software interactive care se bazează pe funcționarea într-un sistem stimul-răspuns

- Modelează un sistem interactiv printr-o colecție de agenți specializați care produc şi reacționează la stimuli existenți în cadrul sistemului

- Modelează un sistem interactiv prin intermediul unor unități computaționale specializate numite Agenți. Un Agent se află la un moment dat într-o stare, posedă o bază de cunoştințe şi este capabil să inițieze sau să răspundă la acțiuni.

- Pot fi privite ca sisteme în evoluție în care fiecare Agent desfăşoară o activitate independentă

- În cadrul sistemelor multi-agent intențiile Agentului pot fi definite ca un scop ce trebuie atins în momentul realizării unui set de acțiuni. Know-how-ul unui agent este abilitatea sau potențialul de a executa o acțiune sau un set de acțiuni şi în acelaşi timp de a emana inteligență ca urmare a rezultatelor obținute.

Funcționalitatea sistemelor multi-agent

Toate acțiunile sau sarcinile pe care un agent le poate îndeplini în cadrul sistemului în care există sunt cerute de către un alt Agent care coexistă în acelaşi mediu. Funcționalitatea unui Agent este definită în concordanță cu rolul său în cadrul sistemului.
Fiecare Agent are un set de cunoştințe despre sistemul în care "trăieşte", cunoştințe care sunt memorate intern în structura sa. Controlul Agentului este realizat în concordanță cu specificația task-urilor pe care trebuie să le ducă la bun sfârşit şi a strategiilor pe care le foloseşte. În funcție de rolul fiecărui Agent, modul de definire a scopurilor, planurilor, strategiilor este diferit.
Procesul de comunicare dintre Agenți se supune unor reguli precise

- Agenții sunt conectați prin legături de comunicație unidirecționale destinate transmiterii de mesaje discrete
- Se presupune că nu există întârziere în transmisia-recepția unui mesaj
- În momentul recepției unui mesaj, Agentul receptor cunoaşte proveniența mesajului (agentul care a emis mesajul)
- Există definită o relație de ordine în ceea ce priveşte emisia-recepția mesajelor

Pe lângă acest schimb de mesaje trebuie realizată o înțelegere între agenți pentru satisfacerea constrângerilor la care sunt supuşi datorită coexistenței în cadrul aceluiaşi sistem. Acest lucru se realizează printr-un proces de negociere format din:

- Cooperare – soluția unei probleme este rezultatul unei interacțiuni cooperative la care participă toți agenții
- Coordonare – permite analiza task-urilor ce trebuiesc realizate şi asignarea proceselor grupelor de agenți.

Sistemele multi-agent profită de participarea dinamică a fiecărei părți componente în beneficiul tuturor:
- agenții individuali nu trebuie să țină o istorie a informațiilor obținute de la alți agenți
- datorită procesului continuu de emitere de informații, informațiile vehiculate în sistem nu sunt învechite
- numărul agenților este sau poate fi într-o continuă schimbare

2. Responsabilitățile – componentă importantă a echipei de lucru în modelele multi-agent

În multe domenii structura unei echipe este formată dintr-un set de roluri predefinite. Fiecare rol are un set specific de responsabilități asociate. Această structură poate creşte eficiența echipei de lucru prin reducerea nevoii de comunicare constantă – multe dintre sarcini fiind incluse în rolul fiecărui membru al echipei.

Conceptul de responsabilitate poate fi şi un mare beneficiu pentru alegerea membrilor echipei într-un sistem multi-agent. Descrierea responsabilităților într-o echipă poate determina agenții să adopte decizii la care fiecare membru s-ar fi aşteptat şi să anticipeze acțiuni ale celorlalți membrii.

În aceste sisteme multi-agent agenții au nevoie să poată gândi dinamic pentru a determina deciziile ce trebuie adoptate, ceea ce depinde foarte mult de interpretarea noțiunii de responsabilitate.

Se poate spune că există două perspective de abordare a responsabilităților retroactiv şi proactiv.
Din punct de vedere retroactiv responsabilitatea reprezintă o relație între un agent şi un anume eveniment care s-a petrecut în trecut şi se caută să se găsească vinovatul pentru producerea acelui eveniment. Acest lucru presupune determinarea unei cauze.
Din punct de vedere proactiv responsabilitatea presupune: cum poate acțiunea agentului de acum să influențeze pe viitor procesul decizional.

Alte aspecte ale responsabilității sunt: persistența şi dependența. Agenții care au anumite responsabilități trebuie să mențină un anumit grad de persistență în îndeplinirea obiectivului stabilit – responsabilitatea există şi în situația în care deleagă pe altcineva să rezolve task-ul respectiv. Având o responsabilitate într-o situație anume înseamnă să depună tot efortul pentru atingerea obiectivului.
Persistența nu este însă suficientă pentru a caracteriza responsabilitatea pentru că nu exprimă natura relației dintre agentul care are responsabilitatea şi agentul căruia i-a fost delegată. Agentul delegat vrea ca obiectivul să fie atins şi cunoaşterea acestei dependențe are implicații importante la nivel mental pentru agentul care are responsabilitatea. Acest lucru va determina agentul să-şi informeze superiorul dacă nu-şi poate asuma această responsabilitate, dacă nu poate îndeplini obiectivul.
Această restricție este importantă pentru transformarea echipelor de lucru în sisteme multi-agent pentru că determină exact tipul de comunicare care ajută echipa să se reorganizeze şi să răspundă dinamic la schimbările neprevăzute ce pot apărea.

În realizarea unui model al responsabilităților **Thomas R. Ioerger şi J. Colby Johnson** (Dept. Informatică, Univ. Texas) au plecat de la stabilirea unei ordini parțiale pentru a reprezenta ierarhia responsabilităților. Responsabilitatea nu este considerată ca o stare unică ci ca o combinație de crezuri şi obiective. Responsabilitățile sunt văzute ca atitudini spre acțiuni. O acțiune are loc la un moment anumit de timp dacă un subset de evenimente anteriore au determinat-o.
Presupunem că acțiunea dorită nu a avut loc încă în realitate şi deci există o serie de cursuri ale evenimentelor care pot apărea în viitor. Responsabilitățile pot fi văzute ca un set de restricții asupra posibilelor variante.

Putem reprezenta grafic responsabilitățile privind delegarea ierarhică între 3 agenți A, B şi C a task-ului θ astfel:

$$A \xrightarrow{>\theta} B \xrightarrow{>\theta} C$$

Săgeata se interpretează prin: "sarcina θ delegată lui ...". Relația inversă va fi "responsabil pentru task-ul θ este ...".
În acest caz agentul A deleagă agentul B cu realizarea sarcinii θ care îl deleagă pe agentul C să o rezolve.
Reprezentarea formală a acestei relații este: $A >_\theta B >_\theta C$.

Responsabilitățile implică relații între agenți relativ la o acțiune concretă, în particular între agentul care deleagă responsabilitatea şi agentul care primeşte responsabilitatea.
Pentru reprezentarea acestei relații între agenți introducem o ordine parțială care poate diferi în funcție de responsabilitate.

Presupunem că θ este o acțiune sau o secvență de acțiuni şi că agentul A are inițial responsabilitatea îndeplinirii acestor acțiuni dar o deleagă agentului B. Vom spune că $B <_\theta A$, ceea ce înseamnă că "agentul B este responsabil cu îndeplinirea sarcinii θ dată de agentul A". dacă B deleagă apoi sarcina θ lui C ordinea parțială se extinde $C <_\theta B <_\theta A$.

Ordinea parțială reprezentând responsabilități poate fi văzută sub forma unor legături directe între agenți în cadrul unui graf. Datorită proprietăților ordinii parțiale (tranzitivitate $C <_\theta A$, antisimetrie $B \not<_\theta C$, antirefelxivitate $C \not<_\theta C$) grafurile trebuie să fie aciclice astfel încât nimeni să nu fie propriul său şef de comandă.

"$>_\theta$" înseamnă că " $\forall$ x,y $(x >_\theta y) \equiv (y <_\theta x)$"

Ordinea parțială poate fi gândită doar ca o relație binară între elementele unei mulțimi care se supune proprietăților de mai sus.

Pentru fiecare responsabilitate există un set unic de perechi P x P unde P reprezintă mulțimea de agenți.
Notăm prin $inv(\theta)$ submulțimea de agenți implicați în fiecare responsabilitate ($inv(\theta) \subset P$).

$$\forall\ X,Y\ (X <_\theta Y) \longrightarrow X \in inv(\theta) \wedge Y \in inv(\theta)$$

Cu scopul de a evidenția schimbările în responsabilități de-a lungul timpului (ca rezultat al delegării) ordinea parțială poate fi indexată (prin întregi) corespunzător la momente diferite de timp.
De exemplu pentru a evidenția schimbarea de responsabilități în exemplul de mai sus putem modifica expresiile pentru a spune:

$$C \not<^t_\theta B <^t_\theta A \text{ şi } C <^{t+1}_\theta B <^{t+1}_\theta A$$

Astfel, ordinea parțială pentru fiecare responsabilitate este dată de fapt de tripletul P x P x Z unde Z este un întreg ce reprezintă momentul de timp.

Cu scopul de a prezenta situații în care agenții au diferite crezuri divergente despre responsabilități vom asocia în mod unic ordinea parțială cu domeniul specific mulțimii crezurilor lor. Deci ordinea parțială poate fi extinsă la o mulțime de tipul: P x P x Z x T unde T = mulțime de domenii posibile.
Această ordine parțială poate fi adăugată alături de funcția *inv* şi rezultă astfel următoarea structură:

$\langle\ \Theta, P, E, Agt, T, B, G, \phi, \{<_{\theta_i}\}, inv\ \rangle$ unde:

Θ = universul în discuție
P = mulțimea de agenți
E = mulțimea evenimentelor

Agt = harta specifică a evenimentelor într-un mediu în care o mulțime de agenți le determină
T = mulțimea de domenii
B, G = relații între crezurile şi obiectivele agenților
ϕ = interpretarea propozițiilor în diferite domenii la diferite momente de timp
$\{<_{\theta_i}\}$ = mulțimea de ordini parțiale, câte una pentru fiecare responsabilitate θ_i definită în cadrul echipei de lucru.
Într-o ordine parțială a responsabilității agenții pot juca trei roluri:

1. Un agent poate fi *elementul minimal* dacă nu există alt agent căruia să-i poată delega responsabilitatea directă
   $$direct\ Resp\ (A, \theta) \equiv inv\ (A, \theta) \wedge (\neg \exists B, A >_\theta B)$$
2. Un agent poate fi *elementul maximal* dacă nu există un alt agent care să-i delege o responsabilitate. Acest agent are o responsabilitate finală
   $$ultimate\ Resp\ (A, \theta) \equiv inv\ (A, \theta) \wedge (\neg \exists B, A <_\theta B)$$
3. Un agent poate avea simultan şi responsabilitate directă şi finală – agenți SINGLETON
   Este util a defini noțiunea de *responsabilitate indirectă* care se referă la agenți care nu sunt minimali.
   $$indirect\ Resp\ (A, \theta) \equiv \exists B, B <_\theta A$$

Există două situații în cazul responsabilității directe dintre doi agenți. Dacă nu există alți agenți în cadrul acestei relații atunci putem face referire la una dintre direcțiile relației ca „*delegat lui ...*" şi la cealaltă direcție (inversă) ca „*responsabilitatea lui ...*".

$$delegated\ (A, B, \theta) \equiv (A >_\theta B) \wedge \exists\, \mathcal{C}\, (A >_\theta C >_\theta B)$$

$$\forall A, B, \theta\ respTo\ (A, B, \theta) \longleftrightarrow delegated\ (B, A, \theta)$$

Persistența

Unul dintre motivele principale pentru definirea explicită a noțiunii de responsabilitate directă şi indirectă este acela de a ajuta în scrierea unor axiome privind responsabilitățile care diferă semnificativ în cele două cazuri.
A avea o responsabilitate în general nu obligă în mod necesar un agent să facă ceva, pe când, a avea o responsabilitate directă presupune o anumită persistență.
De această dată este luat în considerare numai cazul binar în care un agent (superiorul) deleagă o responsabilitate unui alt agent (subordonatul).
Vom prezenta responsabilitatea din punct de vedere al subordonatului care trebuie să fie persistent.
Un agent cu responsabilitate directă va face tot posibilul pentru a se asigura că sarcina este îndeplinită. Este uşor diferit de conceptul de persistență potrivit căruia un agent urmăreşte realizarea scopului individual θ de-a lungul timpului până când una dintre următoarele trei condiții este îndeplinită:

- Scopul este atins
- Agentul ajunge la concluzia că sarcina nu poate fi îndeplinită (scopul nu poate fi atins)
- Schimbările de context fac scopul propus irelevant

La aceste trei condiții mai poate fi adăugată una: agentul poate decide să delege responsabilitatea unui alt agent.
Presupunând că poate găsi un alt agent care poate îndeplini sarcina îi poate delega responsabilitatea, fapt ce re-configurează ordinea parțială la momentul următor de timp prin introducerea unui element minimal în graf. Atunci cei doi agenți nu mai au responsabilitate directă şi deci pot renunța în a mai fi persistenți în îndeplinirea scopurilor lor.

Putem denumi acest tip de persistență *R-persistență* – *R* de la responsabilitate. Scopurile ce trebuiesc îndeplinite prin *R-persistență* le notăm cu RPG (*R-persistenceGoal*) şi definim acest tip de persistență astfel (prin următoarea axiomă):
R-persisteance

RPG (A, θ) ≡ *PGoal* (A, *Done*(A, θ) ∨ [∃ B (*canDelegate* (A, B, θ) ∧ *Done*(*doDelegate* (A, B, θ)))])

Agenții cu responsabilitate directă au RPG: *directResp* (A, θ) ⟶ *RPG* (A, θ).

Această axiomă exprimă ideea intuitivă că agenții cu responsabilități directe trebuie să persiste în realizarea unui scop fie prin a-l îndeplini fie prin a delega sarcina unui alt agent, sau până când scopul devine de neatins.

Deci responsabilitate directă NU înseamnă intenție, deci NU vom spune că: *directResp* (A, θ) ⟶ *Intend* (A, θ).

Privim delegarea ca pa o acțiune pe care agentul o poate îndeplini în condițiile date reprezentată printr-un eveniment de tipul: „*doDelegate*".
Referitor la modul cum este comunicată sarcina noului agent consecința unei delegări este modificarea ordinii parțiale. De exemplu, dacă A deleagă sarcina θ lui B la momentul *t*:

Happens (*doDelegate* (A, B, θ), t) ⟶ (A $>^{t}_{\theta}$ B) ∧ (B $>^{t}_{\theta}$ A) ∧ (A $>^{t+1}_{\theta}$ B)

Această formulă evidențiază câteva aspecte care se produc după o delegare, drept consecințe suplimentare: A va deveni indirect responsabil iar B va deveni direct responsabil, consecințe ce pot fi determinate din proprietățile noii ordini parțiale $<^{t+1}_{\theta}$.
„*canDelegate*" urmăreşte reprezentarea precondițiilor unei acțiuni de delegare care trebuie să fie satisfăcătoare pentru munca sa – o sarcină nu poate fi alocată chiar oricui, există anumite precondiții importante.

În primul rând, superiorul trebuie să aibe autoritate asupra subordonatului (cel puțin în anumite domenii ca de exemplu în acela al structurii ierarhice a echipei).
În al doilea rând noul agent trebuie să fie unul capabil. Cererile pentru capabilitățile agentului pot fi complexe. Capabilitățile se referă de cele mai multe ori la dacă postcondițiile unei acțiuni se vor menține sau nu când un agent încearcă îndeplinirea sarcinii într-o situație în care precondițiile sunt adevărate.
Modele mai complexe de capabilități pot lua în considerare şi alte aspecte:

- timpul disponibil al unui agent
- abilitatea de a respecta termenele limită de realizare a sarcinilor
- nivelul de performanță

Agenții este important să poată observa capabilitățile celorlalți agenți ai echipei de lucru în special atunci când deleagă sarcini.
Se poate defini astfel „*canDelegate*" prin următoarea relație:
canDelegate (A, B, θ, t) ≡ *hasAuthority* (A, B) ∧ *isCapable* (B, θ, t) ∧ (A $<^{t}_{\theta}$ B) ∧ (B $<^{t}_{\theta}$ A) /

Când un agent deleagă o responsabilitate unui alt agent agentul subordonat nu trebuie neapărat să poată îndeplini sarcina singur atâta timp cât o poate delega la rândul lui unui alt agent.
Acest lucru se întâmplă des la nivelul mediu managerial din cadrul companiilor - managerii de la acest nivel acceptă responsabilitățile primite din partea superiorilor numai pentru că ştiu că unul dintre angajații din subordinea lor le poate îndeplini.
Toți agenții care sunt delegați trebuie să se asigure că există o modalitate de îndeplinire a sarcinii chiar dacă o îndeplinesc direct sau deleagă pe cineva să o facă.

Putem descrie acest lucru în mod formal folosind ideea de extensie a ordinii parțiale. O extensie (<') a ordinii parțiale (<) care trebuie să coincidă cu (<) pentru toate relațiile prezentate în (<), dar trebuie să se adauge mai multe elemente sau restricții ale ordinii, adică tripleții din relația binară pentru (<') trebuie să fie un set mai mare decât în cazul (<):

∀ x,y (x < y) ⟶ (x <'y)

Aplicând această relație asupra delegării este necesar ca atunci când un agent deleagă o responsabilitate unui alt agent, primul agent să fie sigur că există o posibilitate de a extinde structura delegării prin adăugarea de agenți la ordinea parțială astfel încât să existe cel puțin un membru care va avea responsabilitatea directă şi care este capabil să rezolve sarcina.
Notații:
„*Porder*(HS)" – declară obiectul H ca ordine parțială peste mulțimea S
„*Below* (X,Y,H)" – încearcă să exprime aceeaşi relație (<) între obiectele X şi Y (presupuse aparținând lui S).

Se poate scrie astfel următoarea axiomă, privind relația de ordine extinsă, care se bazează pe cele 3 proprietăți ale ordinii parțiale:

$\forall$ H J S *porder*(H,S) $\wedge$ *porder*(J,S) $\wedge$ [$\forall$ XY $\in$ S *below*(X,Y,H) $\rightarrow$ *below*(X,Y,J)] $\rightarrow$ *extension* (J,H)

Folosind această notație putem da o definiție îmbunătățită pentru „*canDelegate*":

$$\begin{aligned} \textit{canDelegate}\ (A, B, \theta, t) \equiv\ & \exists H\ \textit{porder}(H, \tau)\ [\forall\ X,Y \in \tau\ (X <^{t}_{\theta} Y) \leftrightarrow \textit{below}\ (X,Y,H)] \\ & \wedge\ \exists\ J\ \textit{extension}\ (J,H) \\ & \wedge [\forall\ X,Y\ \textit{below}\ (X,Y,J) \rightarrow \textit{hasAuthority}\ (Y, X)] \\ \wedge [\exists\ C\ \textit{directResp}(C,J) & \wedge (\textit{below}\ (C,B,J) \vee (C=B)) \wedge \textit{isCapable}\ (C, \theta, t)] \end{aligned}$$

τ = mulțimea de agenți din echipă

H = termen ce se referă la o ordine parțială izomorfă cu delegarea curentă ierarhică $<^{t}_{\theta}$

J = este o posibilă extensie a ordinii parțiale

Această definiție privind sistemul în care responsabilitatea poate fi delegată este importantă în definiția persistenței pentru că împiedică agenții să renunțe la o responsabilitate atunci când ştiu că nu există nici o cale de rezolvare (directă sau indirectă) prin agenții pe care i-au delegat.

Crezuri comune

Există un sens în care superiorul depinde de subordonat probabil datorită unei părți a responsabilității (sau a responsabilității pe care i-a delegat-o).
Subordonații trebuie sa-i informeze pe superiori când realizează că nu pot îndeplini sarcina. Este important de văzut cum sunt motivați agenții să genereze o astfel de comunicare care este esențială în cadrul echipelor de lucru.
Privim responsabilitățile în sensul în care atât superiorul cât şi subordonatul îşi cunosc reciproc dorințele privind scopul propus şi doresc menținerea propriilor crezuri.

Responsabilitățile sunt privite similar, superiorul şi subordonatul ştiu despre scopurile fiecăruia şi doresc să le mențină, ceea ce este oarecum asimetric pentru că doar unul dintre scopuri poate fi îndeplinit.

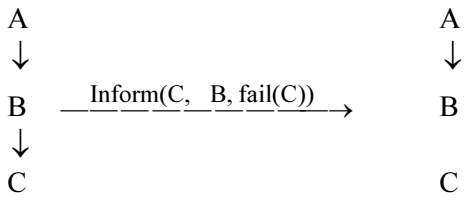
Un scop R-persitent justificabil (explicabil) (A-RPG – *accountable r-persistent goal*) este definit ca un scop R-persistent (în a face o acțiune sau a o delega altcuiva) cu obligația de a fi informat asupra celui căruia i-a delegat responsabilitatea.
Definim un scop *A-RPG* pentru agentul A care trebuie să îndeplinească sarcina θ pentru agentul B (superiorul) astfel:

A-RPG (A,B, θ) $\equiv$ RPG(A, θ) $\wedge$ *BEFORE* (PGoal (A, *MB* ({A,B}, [$\neg$ RPG (A, θ) $\wedge$ *status* (θ)]), $\neg$ RPG (A, θ)))

unde: MB= mutual belief (crezuri comune, mutuale, reciproce)

Crezurile comune sunt considerate drept o mulțime infinită de combinații de crezuri pentru o mulțime de agenți în condițiile în care fiecare agent cunoaşte crezurile celorlalți.

Această definiție vrea să spună că dacă θ nu este adevărat acum dar poate totuşi fi făcut să fie adevărat, atunci agentul A va fi r-persistent în îndeplinirea sarcinii θ. Totuşi dacă θ poate fi atins sau devine de neatins, A trebuie să adopte un scop persistent pentru a stabili un crez reciproc cu agentul B care i-a dat responsabilitatea.
Cea mai importantă consecință a acestei restricții este că agentul subordonat îl informează pe superior când i se întâmplă să eşueze. Aceasta face ca legătura $A <_\theta B$ să fie ştearsă din ordinea parțială dând responsabilitatea directă lui B şi permițându-i să încerce să găsească o cale de a atinge scopul θ



Acest lucru este analog cu definiția unei slabe atingeri a scopurilor în care agenții care împart intenția de atingere a scopului θ au angajamente individuale în atingerea scopului θ dar urmăresc de asemenea sa-i informeze continuu pe ceilalți agenți despre starea scopului θ.
Putem defini mai bine responsabilitățile bazate pe crezuri comune privind scopurile. Este important pentru subordonat să aibe un scop r-persistent explicabil dar şi pentru superior este important să ştie acest lucru iar pentru subordonat să ştie că superiorul cunoaşte acest lucru, şamd.

Putem defini acum responsabilitatea astfel:

$$\forall \text{ A,B, } \theta \, \underline{directResp \text{ (A, } \theta \text{)}} \wedge delegated \text{ (B,A, } \theta \text{)} \longrightarrow \text{A-RPG (A,B, } \theta \text{)}$$
$$\wedge \text{ PGoal (A, } MB \text{ (\{A,B\}, A-RPG (A,B, } \theta \text{)))}$$

$$\forall \text{ A, } \theta \, \underline{indirectResp \text{ (A, } \theta \text{)}} \longrightarrow$$
$$Goal \text{ (A, } Done(\theta)) \wedge \text{ [} \forall \text{ B } delegated \text{ (A,B, } \theta \text{)} \longrightarrow BEFORE \text{ (PGoal (A, MB (\{A,B\}, } \neg Goal \text{ (A,}$$
$$Done(\theta))), \neg Goal \text{ (A, } Done(\theta))) \text{]}$$

Prima axiomă spune că agenții cu responsabilitate directă nu au numai un scop r-persistent explicabil pe care să-l îndeplinească dar se asigură de asemenea că superiorul său cunoaşte acest lucru şi astfel se poate aştepta la toate consecințele (urmările).
A doua axiomă spune că agenții cu responsabilitate indirectă au sarcina de a informa continuu subordonații asupra schimbărilor în vederea atingerii scopului propus. Faptul că superiorul are de îndeplinit scopul ca task-ul să fie realizat nu înseamnă că trebuie să îndeplinească chiar el acel task.
Crezurile comune sunt esențiale în surprinderea dependențelor dintre relațiile de responsabilitate.
Importanța menținerii unui sistem de crezuri comune este dată de faptul că agentul principal (cel care deleagă) poate acum conta pe subordonat fiind acum informat de acesta cu privire la succesul sau eşecul în îndeplinirea task-ului. Agenții încearcă să-şi asume responsabilitățile fiind prompt informați de superiori ori de câte ori au nevoie.

Legătura dintre responsabilități (dependența)

Legătura dintre responsabilități presupune mai mulți agenți. Se pot identifica trei tipuri de responsabilități:
AND – responsabilități privind acțiuni cooperative – toți agenții trebuie să lucreze împreună
XOR – responsabilități privind acțiuni competitive – cel mult un agent poate îndeplini sarcina
OR – responsabilități privind acțiuni compatibile – orice agent (unul sau mai mulți) se poate ocupa de task-ul respectiv

Fiecare dintre aceste responsabilități vor fi atribuite diferit în cadrul grupei de agenți iar aceste interacțiuni necesită de cele mai multe ori comunicare între agenți.

În cazul responsabilităților cooperative (AND) agenții trebuie să se coordoneze şi sincronizeze pentru îndeplinirea sarcinii simultan, aşteptând până când toți agenții sunt pregătiți,.
În cazul responsabilităților competitive (XOR) agenții trebuie să comunice pentru a hotărî cine îşi va asuma responsabilitatea în mod individual.

Toate aceste cerințe de comunicare pot fi definite prin noi restricții asupra crezurilor comune care trebuiesc menținute:

- crezul comun ca toți agenții să fie pregătiți înainte de a acționa în cazul unei responsabilități cooperative
- crezul comun că toți agenții sunt de acord ca un singur agent, acelaşi agent în părerea tuturor, să îşi asume responsabilitatea XOR

Concluzii

Toate cele prezentate sunt importante în construirea sistemelor multi-agent pentru că punctează aspecte importante privind responsabilitățile care sunt necesare în determinarea unui comportament colaborativ corect în cadrul echipei de lucru.
E bine de ştiut în descrierea unei structuri a echipei de lucru care sunt sarcinile asociate fiecărui agent (sau grup de agenți) pentru care fiecare este responsabil.
Responsabilitatea trebuie să fie clară pentru fiecare agent pentru a şti când să acționeze, când să aştepte în defensivă, când să comunice şamd.
Gândirea fiecărui agent asociată cu responsabilitatea poate fi modulată în termeni de scopuri şi crezuri ale agenților.
Conceptul de scop persistent este folosit pentru a sublinia noțiunea că responsabilitatea implică dorința de a face ceva să se întâmple dar este diferită de intenție, şi poate fi delegată permițând altcuiva să o îndeplinească în folosul său.
Responsabilitatea implică dependență în sensul că, de obicei, responsabilitatea este dată de o persoană/un agent care are nevoie ca sarcina să fie îndeplinită/scopul să fie atins.

Natura acestei relații inter-agenți poate fi transpusă prin cererea de menținere a unor crezuri comune de-a lungul părților implicate privind starea scopului, nevoia de validitate şi posibilitatea de atingere a scopului.
Din punct de vedere al unui agent care are o responsabilitate acest cadru reprezintă o bază pentru adoptarea unor decizii inteligente cu privire la când şi cum să acționeze şi să interacționeze cu echipa.

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17. THE AGENT’S ABILITY TO LEARN: IMPORTANCE AND METHODS

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Abstract

Adaptation, learning, communication are important proprieties that agents can posses. However, the necessity to endow the agent with one of these proprieties in a given situation and the chose of the

mechanism that implements them raises some difficulties. The agent's type of environment in which it acts, the communication or collaboration with other agents represents important factors that influence in some extent the architecture of the agent and its performances.

This paper focuses on the learning aptitude of the agent. First, the place of learning in the framework of internal processes of the agent, the impact on other agents and the relationship with another processes, i.e. adaptation, are examined in detail. Then, the various mechanisms and techniques through which the learning process can be realized are succinctly characterized. Finally, the most representative theoretical and practical contributions in the field of agents are emphasized.

The leading aim of this paper is to provide a general view on various alternatives that an agent can use to realize the learning process.

18. DYNAMICS WITH EXPECTATIONS FOR MULTI-AGENT SYSTEMS

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Abstract

The study of the dynamics with expectations for multi-agent systems is relevant in the situation in which the agents – in the process of taking decisions in the present – take into account possible future states. The agents are planning to achieve the individual objectives based on their information of causes, memory of the past and expectations about the future. A dynamical formulation of the interactions between the agents would require a different approach in the situation when their behavior would depend on their expectations and knowledge as well as on the rules governing the evolution of the multi-agent system. The expectations of the agents concerning the future must enter into the dynamical rules governing the evolution of the entire system.

This article examines the behavior of two types of the multi-agent systems where the dynamics with expectations are present. The first one is composed of a collection of agents that competes one another for limited resources, based on the individual strategies. Each agent associates a specific level of the utility for using each resource. The analytical tools of nonlinear dynamics are used in order to describe the system first in the situation when the external environment changes over time and second when the agents incorporate their expectations about the future in their decisions. These expectations have an important role when the agents use past and present information in estimating the expected future level of utility for each resource. A dynamical formulation of these multi-agent systems would be necessary in order to understand the effect of the expectations on the global performance of the multi-agent system.

A second context when the effect of the expectations of the agents is important is given by the question of how spontaneous cooperation in a group of agents can be achieved through individually rational decisions. In a social dilemma problem, a group of agents are in competition one another in order to obtain a common good in the absence of a central authority. Each agent has two choices, either to contribute to the common good or to shirk. The logic behind the decision to cooperate or not changes when the agents interacts one another and since the expected level of utility of each agent influences his present decision. This indicates the importance of including expectations in a dynamical description of the collective action of the group of agents.

The second type of the multi-agent system where agents have different individual objectives is proposed and analyzed with the analytical tools of nonlinear dynamics. The proposed methodology shows the way in which spontaneous cooperation can be achieved when the agents take into account their expectations about the future when making their choice in the present. Moreover, the system can remain trapped for a long time in a meta-stable state. Eventually, large fluctuations may appear due to uncertain information of agents which may cause a transition to the state of a global equilibrium. The effects of the group structure as well as diversity on the dynamics of cooperation are also studied.

I. Computational Ecosystem

In today's financial markets analyzed as multi-agent systems, agents have non-Newtonian properties. They may form plans and consequently their actions appear to be (or are) intentional. On these markets, agents make plans to achieve their goals based on their knowledge of causes, their memory of the past, their predictions for the future as well as their biases and beliefs. In these light,

financial markets are composed of agents which may be capable of learning, possibly by adopting strategies that maximize their performance. Or it could be possible that the agents appear to learn, if agent type evolve over generations, according to a fitness function. Based on this, through learning and planning, the agents on the markets can adapt – to some point - to the changing environment made up of the other agents as well as external events.

Various factors (like social conventions, the cycles of nature, etc) may create periodic fluctuations in the prices of assets traded on stock exchanges. Determining the response to such periodic fluctuations of a large system of agents which operates independently on a financial market is in general much harder instead of predicting their influence on isolated individuals. The aggregate behavior of a system of agents ,on the other hand, determines important characteristics such as system performance and adaptability to the changing environment which characterizes today's markets.

A computational ecosystem proposed in this chapter is based on the researches of Hubermann and Hogg and is a kind of a multi-agent system in which agents "fight" for limited resources. This system is characterized by a distributed control, asynchrony in execution, resource contention as well as cooperation between agents. The agents also suffer from the problems of incomplete knowledge and delayed information. The agents choose between various assets based on their perceived payoffs. In this system, N agents can choose between K assets traded on a stock exchange according to the perceived (but not necessarily correct) expected payoff. These payoffs are measures of the asset's performance (given by the return). Competition and cooperation between agents are taken into account given the fact that between the number of assets held by an agent and the return there is a direct link. In a purely competitive environment like that given by a stock exchange, the return for having a particular asset i would decrease with the fraction of agents $f_i(t)$ already using it. Alternatively, the agents using the same asset could assist one another and in consequence the return might decrease as more agents used the same asset. Each agent evaluates the payoff associated with each asset asynchronously at an average rate α and switches to the asset with the highest payoff.

Moreover, the information available to the agents is sometimes delayed in time as well as imperfect. Given this imperfect information, each agent's perceived payoff differs from the actual value. To account for the fact that an agent's information about the current state of the system can be imperfect and delayed, we add a normally distributed quantity with zero mean and standard deviation σ to each payoff, and delay the information available to each agent by time σ .

In this paper, we consider a model composed of identical agents competing for 2 assets. For this case, the time–evolution of the fraction of agents using the first asset is described within the mean-field approximation by the differential –delay equation:

$$\frac{df_1(t)}{dt} = \alpha(f_1(t) - \rho(f_1(t-\tau))) \qquad \textbf{(1)}$$

where $\rho(f)$ is the probability that the single agent will choose the first asset(asset 1) if a fraction of agents is already using it. In terms of the density-dependent payoff functions for using the two assets (asset 1 and asset 2), $G_1(f_1(t))$ and $G_2(f_1(t))$, $\rho(f)$ is given by :

$$\rho(f_1(t)) = \frac{1}{2}[1 + erf[\frac{G_1(f_1(t)) - G_2(f_1(t))}{2\sigma}]] \qquad \textbf{(2)}$$

The fraction of agents using asset 2 is by consequence $1 - f_1(t)$; the behavior of the system for two different choices of payoff functions related to competitive and cooperative systems has been studied by Kephart et all. The competitive payoffs considered were given by the relations (3) and (4):

$$G_1(t) = 7 - f_1(t) \qquad \textbf{(3)}$$

$$G_2(t) = 7 - 3f_2(t) \qquad \textbf{(4)}$$

In this case, the dynamics of the system–given the uncertainty σ, β - generates three types of behavior of the analyzed system: *(a)* exponential decay to the fixed point given by $\rho(f_0) = f_0$, *(b)* damped oscillations about f_0 and *(c)* persistent oscillations.

On the other hand**,** a system of cooperating agents with the following payoff function can be represented using the equation **(4)** and **(5)**:

$$G_1(t) = 4 + 7 f_1(t) - 5.333 f_1^2(t) \qquad \textbf{(5)}$$

In this case, the payoffs have been chosen to have the same fixed point as in the case with no uncertainty. This system (of agents) and assets exhibits stability, instability , bifurcation as well as chaos for different β and σ .

II. Collective Action

The previous chapter has raised some significant questions such as: if agents take decision to cooperate or not – based on the imperfect information about the group activity and at the same time incorporate expectations about on how their decision will affect other agents- can the overall cooperation be sustained for a long period of time ? How these expectations as well as group size and diversity can affect the power of cooperation?

The mathematical model for these questions (known as collection action problem) takes into account expectations composed of two components: each agent believes that future aggregate collective behavior is related directly by the agent choices in inverse proportion to the size of the group and secondly, that the interactions between agents has a finite duration characterized by an horizon length H . Thus, agents believe that in the long run their type of actions can encourage similar actions on the part of the group.

In this model, each agent can either contribute to the acquisition of the same type of asset for his portfolio or not. At the same time, there is an amount of uncertainty into the relation between member's efforts and group performance. In consequence, it's possible to assume the fact that when an agent– part of a system –intend to participate to the acquisition of the same type of asset, it does so with a probability p and fails with probability $1-p$. Similar, an attempt to defect results in zero contribution with a probability of q and results in intentional cooperation with a probability of $1-q$. In consequence, as well as all attempts are assumed to be uncorrelated, the number of cooperating agents denominated $\hat{n}^c$ could be written as a mixture of two binomial random variables with the mean $< \hat{n}^c >$ as mentioned below:

$$< \hat{n}^c > = p n^c + (1-q)(n - n^c) \quad \textbf{(6)}$$

where n^c is the number of members attempting to cooperate in a group of the size of n .

Let k_i denote the fact that a member intends to cooperate (k_i =1) or not (k_i =1); at the same time let k_i^* denote the fact that the member i wants to cooperate or not in effect. The number of agents who cooperate is:

$$\hat{n} = \sum_j k_j^* \text{ ,√ j} \qquad \textbf{(7)}$$

The parameters p and q equal to 1 corresponds to an error-free world of complete information while the value of 0.5 reflect the case where the effect of an

action is completely divorced from the intent. In the case where p and q deviate from 1 the perceived level of cooperation will defer from the actual attempted amount.

In a simple but general limit collective benefits increase linearly in the contribution of the members, at a rate b per cooperating member. Each contributing individual bears a personal cost c. In consequence, the utility at the time t for a member i is the following

$$U_i(t) = \frac{b}{n}\hat{n}^{c}(t) - ck_i \qquad \textbf{(8)}$$

Using its knowledge of the functional form of the utility function, each agent can deduce the number of the individuals effectively cooperating at the some time by inverting the previous equation (8)

$$\hat{n}^{c}(t) = \frac{n}{b}(U_i(t) + ck_i) \qquad \textbf{(9)}$$

At the same time, the logic behind the decision to cooperate or not, changes when the interaction is ongoing since the future expected utility gains will join present ones in influencing the rational individual's decision to contribute or not to the acquisition of the same type of asset. In the particular case, individual expectations concerning the future evolution of the assets can play a significant role in each member's decision. The importance individuals place on the future depends on how long they expect the interaction to last. In case that they expect the game to end soon then future expected returns should be discounted with respect to the known immediate returns. On the other hand, in case that the interaction is likely to continue for a long period of time then members may be wise to discount the future slightly and make choices that maximize their returns for a long run. It worth to notice the fact that making present choices that depend on the future is rational only if and to the extent that a member believes its choices influence the decisions the others make.

The time scale of the interaction is set by the rate α at which members of the group reexamine their choices. Information about the level of cooperation can be deduced from the individual utility accrued in the past as per equation 9 and at the same time can be delayed by an interval τ; Along with the expectations regarding the future, the fraction observed as cooperating $\hat{f}^{c}$ as well as the reevaluation rate α, determine in part how individuals believe that the level of cooperation will evolve in time.

For the sake of simplicity, we will assume that all members of the group can share a common rationality in their method of forming expectations. Consequently, the future returns expected at a time t^* from the present are discounted at a rate $e^{-\frac{t^*}{H}}$ with respect to immediate expected returns. In a second step, each member expects that their choice of action, when it is reflected in the net benefits received by the others, will influence future levels of cooperation. Since however, the decision of one individual affects another's return by only $+/-\frac{b}{n}$, each member perceives its influence as decreasing when increasing group size. Furthermore, individual changes in strategy are believed to be most effective in encouraging similar behavior when levels of cooperation are high.

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19. RISK CLASS AND SOURCES IN POWER COMPANIES MANAGEMENT

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Abstract

At the disintegration of natural monopoly of electric energy in a number of power companies acting on the energy market, one of the elemental actions which conduct to a good operation in the energy market is Risk Management.

In these conditions, Power Companies must manage them specific risks, in the existing general risks context on the market, trade and financial risks, aiming the risk management politics.

Therefore, a first step supposes the identification of various classes of specific risks. Companies having power supply profile, and the sources that generate these risks, make the study object of this paper.

20. AGENT TECHNOLOGY FOR SUPPLY CHAIN MANAGEMENT

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Abstract

1. Agent technology - definitions, types of agent

Agents are autonomous or semi-autonomous hardware or software systems that perform tasks in complex, dynamically changing environments. Autonomy means the ability to take decisions based on an internal representation of the world, without being controlled by a central instance. Agents communicate with their environment and those changes the environment by improving their performing actions.

2. The supply chain management

A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers.

3. The connections between intelligent agent and supply chain management

To support its global competitiveness and rapid market responsiveness, an individual manufacturing enterprise has to be integrated with its related management systems, its partners, suppliers and customers via networks. The supply chain of a manufacturing enterprise is a world-wide network of suppliers, factories, warehouses, distribution centers and retailers through which raw materials are acquired, transformed and delivered to customers. Agent based approaches provide a

natural way to design and implement manufacturing enterprise integration and supply chain management within such environments.

4. The advantages using agent technology for supply chain management.

The research results have shown that agent based approaches have the following advantages for enterprise integration and supply chain management:

- *increasing the responsiveness of the enterprise to the market requirements;*
- *involving customers in total supply chain optimization;*
- *realizing supply chain optimization through effective resource allocation;*
- *achieving dynamic optimization of materials and inventory management;*
- *realizing total supply chain optimization including all linked enterprises;*
  increasing the effectiveness of the information exchange and feedback.

Agents – definitions, classifications, importance

- **Agent definitions**

The term "agent" is used increasingly to describe a broad range of computational entities. This tends to obscure the differences between radically different approaches, common properties that make agents different from conventional programs.

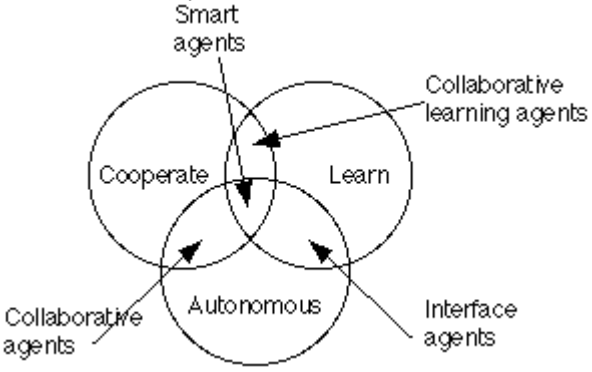
In some domains, the agents are isolated, trying to optimize their own performance. In other domains, the agents are not isolated and can interact with each other. Agent behaviors can then involve coordination with other agents.

- **Properties of the agents**

- **Autonomy**: agents operate without the direct intervention of humans or others, and have some kind of control over their actions and internal state;
- **Social ability**: agents interact with other agents (and possibly humans) via some kind of agent-communication language;
- **Reactivity**: agents perceive their environment, (which may be the physical world, a user via a graphical user interface, a collection of other agents, the Internet, or all of these combined), and respond in a timely fashion to changes that occur in it;
- **Pro-activeness**: agents do not simply act in response to their environment; they are able to exhibit goal-directed behavior by taking the initiative;
- Agents contain level of **intelligence**, from fixed rules to **learning** engines that allow them to adapt to changes in the environment;
- Agents act **reactively** and **proactively;**
- Agents **cooperate** with other agents to carry out more complex tasks than they themselves can handle.
-

- **Classification of agents (Nwana's classification)**

- Mobility: static or mobile;
- Reasoning model: deliberative or reactive;
- Ideal attributes: autonomy, learning and cooperation;
- Role: information, management;
- Hybrid: combination of the above.



(Source: H. Nwana, (1999) "Software Agents: An Overview")

- The intelligent agents have three **functions**

- To identify the goods and the services (that is compared with activities like: recovery, filtration and extraction dates by intelligent agents);
- To find the solutions for optimization problems (to obtain a maximum profit for producing and a maximum utility for consumer);
- To manage the auction strategies from the negotiation processes.

- The importance of using agents

The independent agents and multiagent systems represent a new method of analyze, design and implementation for complex system. The vision based on agent's gives a lot of tools, techniques and paradigm with a high potential to improve the way that people make and implement informational technology. Agents are and will be used in a lot of applications, from small systems like personalized e-mail filter to huge, complex systems, like virtual economies. In the first step of our analysis, we can say that these systems do not have something in commune, but the agents make the connections and these variety applications can be characterized in agent theory terms.

The supply chain – definitions, classifications, importance

- **The supply chain definitions**

The supply chain contains big and complexes systems composed by a lot of entities that are connected. The supply chain includes all the organizations and processes that are involved in developing products and services from the point of the customer organizations. The management of the supply chain represents strategies and activities that are associated with supply chain.
The supply chain has a lot and distingue characteristics: generate an informational flux: typical order, signal demand and in the other meaning generate material and a product flux that satisfied the demand.

- **The supply chain management definitions**

Supply chain management is the alignment of the functional entities related to the planning, organization and control of products to provide for the seamless coordination of these products.
Supply chain management is the integration of the organizational functions and processes related to the planning, scheduling and physical movement of products or materials.
Integrated supply chain strategies are targeted to achieve the objectives:

- Pushing the new product(s) development process faster;
- Improving the use of technology;
- Bringing new products to market faster;
- Minimizing investment in resources;
- Reducing specific costs;
- Establishing efficient response/ cycle times.

- The importance of the supply chain

A supply chain represents resource-connected series for different organizations and activities involved in the goods and services production for customer. Or:

A supply chain represents a facility connections and distribution options witch has the functions: obtain the materials, transform this materials in intermediate or finite products and distribute them to the customers.

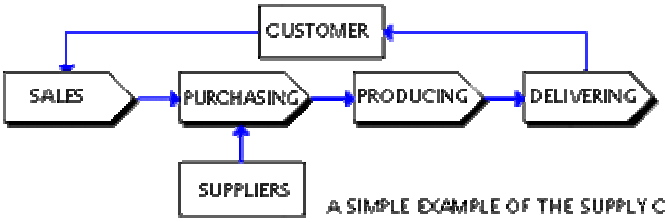
Each chain starts to identify the necessity of the customer and ends satisfying them. Trying to obtain maximum of satisfaction it is necessary to analyze the variables witch characterized individual companies.

The managers need to identify all the steps from the customer supply chain to find out the product and service elements that will be done.

Supply chain technologies were primarily designed to reduce the friction in the flow of raw materials, components, and finished goods across the enterprise and its global supply chain without much thought to security concerns.

In order to support its global competitiveness and rapid market responsiveness, an individual manufacturing enterprise has to be integrated with its related management systems (e.g., purchasing, orders, design, production, planning & scheduling, control, transport, resources, personnel, materials, quality, etc.), its partners, suppliers and customers via networks (local networks, the Internet or Intranet), which are, in general, heterogeneous software and hardware environments.

Supply chains are large consisting of many entities interacting in complex ways. The challenge faced by companies is how to design and manage such systems:



(Source: Swaminathan, J. M. (1996), "Quantitative analysis of emerging practices in supply chains").

Successful supply chain management is extremely complex. The complexity is due to the fact that individual supply chain partners may have different and possibly conflicting objectives, and that the supply, demand, and partner-to-partner relationships may change over time.

A supply chain company has the following goals:

- To understand the organization of an entire supply chain system;
- To understand the operation process within a supply chain system;
- To identify the supply chain management strategy options.

A typical supply chain faces uncertainty in terms of supply, demand, and process. The framework reduces the effort involved in modeling various alternatives and measuring their performance through simulation under different assumptions about uncertainties. This eases the ability of decision makers to quantitatively assess the risk and benefits associated with various supply chain reengineering alternatives.

Multiagent computational environments are suitable for studying classes of coordination issues involving multiple autonomous or semiautonomous optimizing agents where knowledge is distributed and agents communicate through messages (Bond & Gasser, 1988). Because supply chain management is fundamentally concerned with coherence among multiple decision makers, a multiagent-modeling framework based on explicit communication between constituent agents (such as manufacturers, suppliers, distributors) is a natural choice. Structural elements are modeled as heterogeneous agents that utilize control elements in order to communicate and control the flow of products within the supply chain. The models emphasize the capture of the locality that typically exists with respect to the purview, operating constraints, and objectives of individual supply chain entities, and thus promotes simultaneous analysis of supply chain performance from a variety of organizational perspectives. The modular architecture of framework enables one to develop executable models for different situations with limited additional effort.

Agents from the supply chain interact with one another to form a complex system that subsequently has emergent properties. For example, in an economy, each firm acts as an agent, and multiple firms make up the complex system known as the economy. One emergent aggregate property of the economy is the gross domestic product. In the complex system known as the nervous system, individual neurons interact in such a manner that behavior emerges.

Agent Technology for Supply Chain Management

The supply chain of a manufacturing enterprise is a worldwide network of suppliers, factories, warehouses, distribution centers and retailers through which raw materials are acquired, transformed and delivered to customers. This network also, in general, involves heterogeneous environments. Agent based approaches provide a natural way to design and implement manufacturing enterprise integration and supply chain management within such environments. In 1993, Fox, was the first to propose organizing the supply chain as a network of cooperating, intelligent agents. In 1996, Swaminathan used a multi-agent framework for modeling supply chain dynamics.

Each agent performs one or more supply chain functions and coordinates its actions with other agents. In the supply chain library contain two categories of elements distinguished: structural elements and control elements. Structural elements including production elements (retailers, distribution centers, plants, suppliers) and transportation elements are modeled as agents. Control elements (inventory, demand, supply, flow and information controls) are used to help in coordinating flow of products in an efficient manner with the use of messages.

The hybrid agents, based on mediator-centric architecture, are used to integrate partners, suppliers and customers dynamically with the main enterprise through their respective mediators within a supply chain network via the Internet and Intranets. Agents can be used to represent manufacturing resources (machines, tools etc) and parts, to encapsulate existing software systems, to function as system/subsystem coordinators (mediators), and to perform one or more supply chain functions. Also, some researchers have proposed applying mobile agent technology to enterprise integration and supply chain management (Brugali in 1998, Papaioannou & Edwards in 1998, Yan in 1998).

"Mobile agents" are programs that go from place to place on your behalf to carry out tasks for you. For example, an agent might wander among several suppliers, gathering pricing information and perhaps even ordering products for you. The key issue here is that the program moves, carries state with it, and makes its own decisions about where to go next, though it may or may not be "intelligent" in the intelligent agent sense. "Intelligent agents" are programs that make decisions on your behalf, such as filtering incoming email or news stories. The key issue here is that the program handles complex information and decisions. It may or may not be mobile.

The security problem resulting from the open architecture of agent based systems, particularly when using the Internet and the mobile agent technology, has been recognized by both manufacturing enterprises and the researchers in this area. This is not unique to agent-based systems and may be mitigated through further research.

A complex system is commonly understood as any system consisting of a large number of interacting components (agents, processes).

The main idea of the agent-oriented approach to the formation of supply chain is to look at this process as a multiagent decision problem. The distributed solution of this problem is done in four steps:

- Goal specification: description of the global process, of the product or service to be delivered by the supply chain;
- Decomposition: mapping of the goal specification into partial processes;
- Allocation: selection of potential partners and mapping of partners to the partial processes identified in the decomposition step.
- Synthesis: definition of the global process by the composition of the partial processes instantiated in the allocation step.

- **The connections between intelligent agent and supply chain management**

To support its global competitiveness and rapid market responsiveness, an individual manufacturing enterprise has to be integrated with its related management systems, its partners, suppliers and customers via networks. The supply chain of a manufacturing enterprise is a world-wide network of suppliers, factories, warehouses, distribution centers and retailers through which raw materials are acquired, transformed and delivered to customers. Agent based approaches provide a natural way to design and implement manufacturing enterprise integration and supply chain management within such environments.

Intelligent agent-based systems can be used with advantage in the automation of a variety of tasks in the supply chain, namely searching of information and negotiation. The use of agents' technology introduces the problem of standardization: agents, as software programs, must communicate and understand each other without human intervention.

- **Enterprise Integration and Supply Chain Management**

Enterprise Integration means that each unit of the organization will have access to information relevant to its task and will understand how its actions will impact other parts of the organization thereby enabling it to choose alternatives that optimize the organization's goals.

The supply chain of a manufacturing enterprise is a world-wide network of suppliers, factories, warehouses, distribution centers and retailers through which raw materials are acquired, transformed and delivered to customers. Improving supply chain management is a key strategy for increasing the

enterprise's competitive position and profitability. Consequently, enterprises are moving towards open architectures for integrating their activities with those of their suppliers, customers and partners within wide supply chain networks. Agent-based technology provides a natural way to design and implement such environments.

- **The advantages of using agent technology for supply chain management**

Agent based approaches have the following advantages for enterprise integration and supply chain management:

- Increasing the responsiveness of the enterprise to the market requirements;
- Involving customers in total supply chain optimization;
- Realizing supply chain optimization through effective resource allocation;
- Achieving dynamic optimization of materials and inventory management;
- Realizing total supply chain optimization including all linked enterprises;
- Increasing the effectiveness of the information exchange and feedback.

The uses of the agent technology:

- Customers will employ software agents to help them to identify and locate products and services they require;
- Customers and suppliers will empower their agents to negotiate electronically with other agents in order to buy and sell products and services within this complex multimedia information trading system.

Conclusion

Supply chain formation is an important problem in the commercial world, and can be improved by greater automated support. The multiagent systems community should work to develop new solutions to the problem.

The artificial intelligent and multiagent system communities are well positioned to develop technology that will increasingly automate the decision making in supply chain.

Agents have specialized capabilities and can perform only certain combinations tasks, an agent may delegate subtasks to other agents, which may in turn delegate further subtasks.

As manufacturers attempt to increase supply chain performance, there is a critical need to gain a deeper understanding of the impact of decisions on their operations as well as those of their partners. Simulation has been found to be one of the popular and suitable mechanisms for understanding supply chain dynamics. Many times supply chain reengineering decisions are made with a probabilistic view of the future. As a result, there is a necessity for decision support tools that can help managers to understand the costs, benefits, and risks associated with various alternatives.

Agent technology is an important method for supply chain making the connections between the complexity and large volume of commerce services, particularly on open communication networks.

The biggest advantage that agents bring is their ability to automate previously manual operations: agents can visit more web site and gather more information faster. More sophisticated agents can also exhibit more advanced capabilities when carrying out their foresee tasks: automated negotiation or even learning.

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21. MANAGEMENT BY OBJECTIVES - A CHALLENGE FOR BANKING

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Abstract

Being promoted to branch manager is often a bit like being thrown into the deep cold water. Expectations are tremendous, not just from the organization, which decided that promotion, but also

from the branches' team and customers. The bank expects certain revenues from any branch. In order to get the anticipated revenues, the branch manager must be sure that the branch sells. The sale process is based on a plan: first the goals have to be determined, and then the manager has to motivate people to achieve those goals. On top of it all, the branch manager has to control and audit what everybody is doing. Managing is more than getting organized. It is about establishing an environment, where people work together in an organized, effective and motivated way to optimize customer, employee and shareholders value. The philosophy of management by objectives is that every employee has reached a recognized level of performance, from which he or she can, and should improve. Management by objectives is a system in which specific performance objectives are jointly determinate by subordinates and their superiors, progress toward objectives is periodically reviewed, and rewards are allocated on the basis of this progress. In the branch, the objectives should be part of the general objectives of the bank and each individual's objective is part of the branches' objectives. The present performance should be improved, whatever it is. In order to get working this system, the branch managers should be fair, rewarding those who really want to move forward and penalizing those who do not. It is a system whereby you either move upwards and outwards, but where there is not room for mediocrity.

22. THE ECB'S "NEW" STRATEGY

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Abstract

This paper debates the ECB's monetary policy strategy after the evaluation and clarification of May 2003. The aim is not to explain the meaning and details of the clarification, but rather to provide a description of the main features of the strategy. The primary objective of the ECB and of the single monetary policy for which it is responsible is defined by the Treaty as the maintenance of price stability. The strategy consists of two "pillars" which organize the information and analysis underlying policy discussions and constitute a framework within the forward-looking assessment of the economic situation can be undertaken, based on as full a set of economic information and analytical tools as possible. In its recent review of the strategy, the Governing Council of the ECB emphasized the medium-term orientation of its monetary analyses and clarified the role of monetary analysis in the strategy.

23. COMPLEX DYNAMICS AND FINANCIAL FRAGILITY IN AN AGENT BASED MODEL

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Abstract

This paper approach the model of an agent-based economy in which heterogeneous agents - firms and a bank – interact in the financial markets. The heterogeneity is due to the balance sheet conditions and to the size. At the aggregate level, output displays changes in trend and volatility inducing rise to complex dynamics. As empirical analysis shows, the average solvency and liquidity ratios point of highest values during recessions.

At the firm level, the model generates different issues:

i) firm sizes left-skewed distributed;

ii) growth rates Laplace distributed and small idiosyncratic shocks can generate large aggregate fluctuations.

The real (supply) side of the model is based upon the firm's behavior. Each firm chooses how much to produce, how much to invest, on the base of its balance sheet, the financial fragility of which is determined by the equity ratio. The capital is the only input. The credit relation of the firm's sector is modeled with one monopolistic bank.

24. USING INTELLIGENT AGENTS IN CRM APPLICATION

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Abstract

The every day term – agent, backing away from technology, means "one who acts for, or in the place of another".

An open digital market is a complex and non-deterministic system, often producing results that are ambiguous and incomplete.

Agent technology addresses change and complexity, and is now crucial in non-deterministic systems such as workflow, data mining, production scheduling, supply chain logistics and most recently, Customer Relationship Management (CRM) software applications.

How could we use agent technology applications to help employees perform tasks faster and more accurately, in order to meet customers' needs and fulfill company's objectives ?

The paper debates the effects of adding agent technology to customer relationship management applications, in the actual context of significant growth of market competition.

25. AN OLG FRAMEWORK ANALYSIS OF NDC AND PAYG PENSION PAY-OFFS FOR ROMANIA

Author: Assistant Professor ***Eugen-Iulian Mihăiță***, PhD
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Abstract

This paper adapts the model of intergenerational risk-sharing used by Kruse (2002) to compare the outcomes from reforming the Romanian public pension pillar in two different ways. What are the effects and evolution of pension rights from the implementation of either a Notional Defined Contribution (NDC) system or reforming the Pay-As-You-Go (PAYG) by adopting a pension points system? After running several scenarios within a stylized economy (similar to Kruse (2002)) the paper employs this OLG model to make simulations in the actual Romanian pension system conditions.

Keywords: *OLG model, pension reform, NDC, PAYG Romania. JEL classification: H55; J11; J14; J21; J26.*

26. THE IMPORTANCE OF FINANCIAL MARKETS` GLOBALISATION

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Abstract

The expansion of world trade, backed up by the capital flows, the unprecedented progress of science and technology, the transition of the economic system to a form of market economy have led to the acceleration of the process of regional and world integration. The globalization has created new types of relations between states, economies, governments and people.

Globalization is a process which implies a multitude of positive aspects, among which can be noted the deepening of relations between states and persons; changes in politics (the promotion of economical efficiency by liberalizing the national markets); improvements of living conditions at a global level.

The international finance witnessed, in time, a real change, which was observed in the form of a greater interdependence of national financial spaces, in the form of the interconnection of the stock exchanges, and in the form of the solidarity policy of interests and proliferation of new financial instruments, which allow the transgression from one currency to the other, as the operators will anticipate. Thus has been realized a global financial market, governed by its own rules and being characterized by an ever hierarchical structure. The progress of the means with which the transfer of

information is realized, the uses of satellites and of electronics have contributed to the process of financial globalization and unification.

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Expansiunea comerţului mondial, alături de fluxurile de capital, de progresul tehnico-ştiinţific şi tranziţia la economia de piaţă, au dus la accelerarea procesului de integrare regională şi mondială. Mondializarea a creat noi tipuri de relaţii între state, economii, guverne şi persoane.

Globalizarea comportă o serie de aspecte pozitive, printre care amintim: promovarea eficienţei economice prin liberalizarea pieţelor naţionale, adâncirea relaţiilor dintre state şi persoane, îmbunătăţirea condiţiilor de viaţă la nivel global.

Procesele de liberalizare, dereglementare şi inovare reprezintă rezultatul globalizării financiare. Variaţiile cursurilor de schimb şi ale dobânzii au stat la originea noilor instrumente de acoperire a riscurilor sub formă de opţiuni, contracte futures, swap, grupate în prezent pe pieţe specifice. Amploarea transferurilor financiare şi a mişcărilor de reciclare a capitalurilor din anii 70, ocazionate de cele două şocuri petroliere, precum şi trecerea la cursurile flotante reprezintă impulsurile care au generat expansiunea mecanismelor de transformare financiară internaţională, principalul vector reprezentându-l piaţa eurodevizelor.

Finanţele internaţionale au suferit în timp o transformare majoră, marcată de creşterea interdependenţei spaţiilor financiare naţionale, de ienterconexiunea burselor de valori, de politica solidară a dobânzilor şi de trecerea la noi instrumente financiare, permiţând saltul de la o monedă la alta după cum apreciază operatorii. S-a realizat astfel o piaţă financiară globală, guvernată de legi proprii şi care dispune de o structură ierarhizată integrată. Procesul de unificare şi globalizare financiară a fost posibil graţie progresului tehnicilor de transmitere a informaţiei, utilizării sateliţilor şi electronicii.

Una din caracteristicile produselor financiare o reprezintă standardizarea, acelaşi produs (opţiune sau contract la termen în devize), putând fi negociat la New-York, Londra, Sydney, Paris sau Tokyo. Produsele financiare sunt tot mai complexe şi sofisticate, în spatele lor rămânând un capital de proporţii impresionante.

Expansiunea finanţelor globale este însoţită de progresul pieţelor de schimb. De la simplu centru de conversie a monedelor naţionale, piaţa de schimb tinde să devină nucleul activităţilor financiare internaţionale. Trecerea de la o monedă la alta, adaptarea continuă a structurii portofoliului de titluri, acordarea creditelor într-o deviză şi rambursarea lor în altă deviză , au devenit astăzi operaţiuni de rutină. Rolul persoanelor fizice tinde să fie neînsemnat, ca urmare a rolului de piaţă interbancară îndeplinit de piaţa de schimb.

Piaţa eurodevizelor , ca şi cumulare de capitaluri lichide în monede convertibile a avut drept mobil al apariţiei şi dezvoltării faptul că s-au putut obţine randamente superioare comparativ cu pieţele interne. În categoria factorilor care au susţinut dezvoltarea pieţei eurodevizelor, se includ: apariţia centrelor offshore alimentate cu fonduri provenite din afaceri cu ţiţei, creşterea volumului fondurilor solicitate de sectorul public din ţări vest-europene, acoperirea deficitelor balanţelor de plăţi rezultate din creşterea facturilor petroliere prin împrumuturi de pe piaţa eurodevizelor, finanţarea marilor proiecte industriale.

Astfel, economia financiară mondială poate face faţă necesităţilor de finanţare, înregistrându-se un succes al economiei bazate pe credit. Europieţele reprezintă imense pieţe de fonduri care funcţionează în afara statelor ca pieţe de gros, ce tratează doar sumele importante, ca pieţe ce nu sunt strict controlate de autorităţile monetare.

Piaţa euroobligatară s-a dezvoltat ca urmare a restricţiilor existente pe pieţele financiare din Europa, agenţii economici îndreptându-se astfel spre euroobligaţiuni.Acestea au ca suport o eurodeviză şi sunt preferate de investitori întrucât titlurile sunt negociabile, la purtător, asigurându-se claritatea şi siguranţa lor.Printre cele mai active instituţii implicate, amintim: Banque National de Paris, Credit Suisse, Citibank, Merrill Lynch, Nomura, Deutsche Bank, Societe Generale, Paribas, etc.

Pe pieţele obligatare internaţionale, investitorii sunt grupaţi în două mari categorii: individuali şi instituţionali.Investitorii instituţionali sunt cei mai importanţi pe piaţa primară şi cei mai activi, întrucât piaţa pe care o întreţin le permite o gestiune dinamică a portofoliilor.Aceştia sunt reprezentaţi de marile bănci internaţionale, băncile comerciale şi de investiţii, băncile centrale, fondurile de investiţii, societăţile de asigurări şi casele de pensii.

Piaţa secundară le permite investitorilor recuperarea capitalului investit, în cele mai bune condiţii, aceasta fiind o piaţă over the counter, întrucât nu există o piaţă oficială pentru cotarea acestot titluri.Operatorii pe piaţa euroobligatară poartă denumirea de market makers şi dealers., iar pentru

operatorii de naționalități diferite a fost instituit un mecanism care să asigure securitatea tranzacțiilor şi să rezolve problemele de transfer, asigurare, rezultate din mişcările de titluri dintr-o țară în alta.

Piața internațională a acțiunilor.În scopul atragerii investițiilor de portofoliu, guvernele implicate în programe de privatizare au utilizat tehnici globale de plasament.Aceste investiții răspund cel mai bine intereselor investitorilor naționali şi internaționali, presupunând restructurare şi modernizare cu fonduri atrase de pe piețele internaționale.Diversitatea produselor financiare la dispoziția emitenților, tehnicile actuale de sindicalizare şi plasament, permit oricărei societăți mărirea acționariatului şi utilizarea piețelor financiare străine, cu condiția desfăşurării unei activități serioase şi profitabile.Spre deosebire de celelalte categorii de titluri, acestea iau în considerare specificul legislațiilor naționale.

Euroefectele pe termen scurt şi mediu au apărut pe piața financiară internațională în anii '80, noțiunea de euroefecte cuprinzând: Euro-Commercial Papers (ECP), Euronotes (EN), Euro Medium Tern Notes (EMTN). Deosebirea dintre ele constă în regularitatea tirajelor, ECP presupun programe cu emisiune continuă, în timp ce EN pot face obiectul unor tiraje neregulate. Euroefectele sunt asimilate juridic euroobligațiunilor.Emisiunile se efectuează în funcție de necesități, prin intermediul dealerilor, scadențele putând fi extinse sau restrânse după dorința emitenților; eliminarea consorțiului bancar conduce la cheltuieli mult mai reduse.

Emisiunile de euroefecte depind de evoluția ratei dobânzii.Pentru o mai bună lichiditate se practică răscumpărarea titlurilor de către emitent pe piața secundară, sau rambursarea anticipată, urmată de anulare, în orice moment.Principalii investitori sunt marile întreprinderi, băncile de arbitraj şi societățile de plasament colectiv în valori mobiliare.Aceste operațiuni reprezintă pentru marile întreprinderi importante surse de profit.Recurgerea la astfel de plasamente presupune o bună cunoaştere a piețelor, precum şi asumarea riscurilor.De aceea firme mari au preferat organizarea acestui tip de activități în cadrul unor filiale de tip bancar, devenite bănci de arbitraj.

Cea mai importantă evoluție structurală şi instituțională din economia mondială a ultimilor ani o reprezintă dezvoltarea finanțelor internaționale. Direcțiile de evoluție ale ordinii mondiale, coerența sistemului financiar internațional, dovedesc traversarea unei perioade de profunde mutații, reprezentând perioada de adaptare la evoluțiile de ansamblu ale sistemului mondial, spre o economie deschisă, liberalizată.

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28. THE OBJECTIVES OF MANAGEMENT BANKING RISKS

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Abstract

The management of risks is, firstly, in a bank, the responsibility of its superior leadership and of the executive management, which must accomplish the directives of the top management.

The superior leadership of the bank has, as the most important purpose, the maximization of „shareholders value" but in the same time, it must have into attention the requirements of customers, employees and society, for the task of coordinating the risk management. For this, the bank management must settle for objectives in the field of risk management. As a result, the global objectives of risk management are:

- *identifying and evaluating risks;*
- *control of risks;*
- *eliminating or avoiding of risks;*
- *financing of risks.*

Identifying and evaluating risks is the first component of global risk management, in which is necessary to figure out the risk associated with every type of banking product and service.

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Managementul riscurilor într-o bancă este, în primul rând, responsabilitatea conducerii sale superioare şi a conducerii executive, care trebuie să îndeplinească directivele conducerii de la vârf.

Conducerea superioară a băncii are ca prim deziderat maximizarea "valorii acţionarilor", dar, în acelaşi timp, trebuie să aibă în vedere cerinţele clienţilor, salariaţilor şi societăţii în coordonarea managementului riscurilor. În scopul realizării acestui deziderat, conducerea băncii trebuie să-şi stabilească obiective în domeniul gestionării riscurilor. Astfel, obiectivele globale ale gestiunii riscurilor sunt:

- identificarea şi evaluarea riscurilor;
- controlul riscurilor;
- eliminarea sau evitarea riscurilor;
- finanţarea riscurilor.

Identificarea şi evaluarea riscurilor

Identificarea şi evaluarea riscurilor constituie prima etapă a gestiunii globale a riscurilor, în cadrul căreia este necesară determinarea riscului asociat fiecărui tip de produs şi serviciu bancar.

Unele riscuri sunt evidente pentru oricine, altele nu pot fi identificate, indiferent de măsurile de precauţie luate, până la declanşarea lor şi provocarea de pierderi în activităţile respective. În aceste condiţii, se recomandă o maximă atenţie pentru identificarea oricărui risc posibil, în vederea limitării la maxim a riscurilor neidentificate.

În activitatea de identificare şi evaluare a riscurilor, banca trebuie să pornească de la activitatea de planificare a principalelor linii de activitate, respectiv de la strategia ce o va adopta. Aceasta deoarece orice nou produs sau serviciu presupune şi o nouă procedură în depistarea şi anticiparea noilor riscuri accidentale, pentru a se obţine cele mai bune metode de tratare a acestora.

Se poate spune că identificarea şi analiza riscurilor devine o doctrină importantă şi absolut necesară o dată cu schimbările ce apar în activitatea băncilor şi riscurile rezultate.

După ce au fost identificate riscurile asociate fiecărui produs sau serviciu bancar este necesară elaborarea unor scenarii posibile pentru a putea determina frecvenţa şi amplitutidinea fiecărui tip de risc. Aceasta deoarece frecvenţa se referă la numărul de apariţii al evenimentelor asociate unei expuneri pe parcursul orizontului de planificare, iar amplitidinea acestora măsoară impactul financiar pe care îl are producerea evenimentelor asociate expunerii la risc.

Astfel, un manager poate dobândi o bună perspectivă asupra nivelului riscului asociat unei anumite expuneri numai prin combinarea frecvenţei cu amplitudinea riscului. Această combinare presupune agregarea nivelului de risc pentru fiecare expunere şi pentru fiecare categorie de risc pentru a se putea identifica riscul pentru fiecare unitate bancară.

Un element important în depistarea riscurilor chiar înainte ca ele să devină realitate îl constituie comunicaţiile permanente între compartimentele băncii, asigurând totodată posibilitatea controlării riscurilor din momentul apariţiei şi momentul descoperirii acestuia, prin analiza înregistrarilor contabile şi financiare.

Controlul riscurilor

Un al doilea obiectiv al gestiunii riscurilor bancare, controlul riscurilor, vizează minimizarea cheltuielilor asociate fiecărui tip de risc identificat pe produse şi servicii bancare ce nu a putut fi eliminat sau evitat.

Se consideră că momentul cel mai oportun pentru declanşarea controlului riscului este cel al lansării unei noi acţiuni, când se încearcă stăpânirea riscului prin anumite prevederi din contract.

Sarcina de a efectua controlul riscului revine fiecărei bănci în mod permanent, dar totodată şi băncii centrale prin intermediul unor departamente specializate şi de supraveghere.

Managerii bancari trebuie să determine care sunt principalele tipuri de activităţi de control pentru fiecare tip de risc în parte, cunoscând caracteristica şi evoluţia probabilă a acestora. Pentru a controla riscul de piaţă banca poate apela la mai multe tehnici de gestiune a bilanţului sau de diversificare a portofoliului, pe când în cazul riscului de lichiditate se poate apela la înscrierea şi titularizarea unor credite sau creşterea frecvenţei negocierilor.

Eliminarea sau evitarea riscului

Eliminarea sau evitarea riscului se realizează prin cunoaşterea şi îndepărtarea cauzei care îl produce, adică prin reproiectarea activităţilor asociate şi a fluxurilor de operaţii. În acest sens unele

societăţi bancare au început să recurgă la o serie de soluţii radicale cum ar fi renunţarea la unele probleme sau servicii bancare neprofitabile sau generatoare de risc.

Necesitatea de eliminare sau evitare a riscului se impune tot mai mult ca urmare a situaţiilor apărute ce determină societăţile bancare să renunţe la o serie de operaţiuni specifice ce sunt preluate de alte instituţii şi firme (cum ar fi operaţiunile cu carduri efectuate de marile magazine). În aceste condiţii băncile sunt obligate să-şi orienteze activitatea spre alte domenii profitabile, dar în acelaşi timp riscante, cum ar fi extinderea şi diversificarea operaţiunilor speculative pe piaţa internaţională.

Importanţa eliminării şi evitării riscului rezultă din efectul pe care aceste operaţiuni îl au asupra reducerii costurilor totale ale băncilor, costuri asociate riscurilor. Acest lucru se produce numai daca banca a apreciat corect cheltuielile asociate şi veniturile ajustate în funcţie de risc pentru fiecare gamă de produse sau activităţi.

Finanţarea riscurilor

Finanţarea riscurilor ca obiectiv global al gestiunii riscurilor presupune nu numai acoperirea riscurilor prin constituirea de rezerve, ci şi transferul riscurilor prin asigurare sau operaţii cu instrumente derivate.

În general se procedează la acoperire în cazul riscurilor a căror frecvenţă şi amplitudine a expunerii sunt foarte previzibile sau când nu există alte asigurări pe piaţă. În cazul în care expunerea nu este foarte previzibilă se apelează la transferarea riscului, aceasta fiind însă condiţionată de existenţa unor pieţe de asigurări convenţionale.

Pentru acoperirea riscului se poate folosi un program formal de finanţare elaborat pe baza prognozelor privind pierderile anticipate sau prin prelevări pentru fondurile de rezervă pentru pierderi de creditare, fie prin trecerea pierderilor pe cheltuieli, fie prin acoperirea lor din capital.

Ca o condiţie pentru autofinanţarea corectă a riscurilor apare necesitatea acoperirii unor familii de riscuri şi existenţei unei baze proprii de baze statistice referitoare la frecvenţa şi amploarea riscurilor.

În elaborarea unui program de asigurare pentru bancă în ceea ce priveşte asigurarea transferului riscurilor, banca are de ales între mai multe posibilităţi:

- negocierea centralizată cu limitarea numărului de polițe;
- negocierea descentralizată, polițele fiind încheiate separat;
- programe de asigurare specifice pentru diferite activităţi bancare.

Divizarea şi transferul riscului se poate realiza şi prin constituirea de consorţii între mai multe bănci. De asemenea, se poate evita concentrarea riscului prin reglementări proprii sau ale băncii centrale privind limita impusă în acordarea de credite unuia şi aceluiaşi debitor.

Deşi ar trebui să se apeleze la transferul riscurilor doar în final, după ce au fost parcurse toate celelalte etape, în practică transferarea riscurilor este prima, şi câteodată chiar singura modalitate de abordare a gestiunii riscurilor bancare.

Astfel, în ansamblul activităţii bancare, o importanţă deosebită o are asigurarea unor structuri adecvate pentru a facilita monitorizarea riscului .

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29. THE REFORM OF ROMANIAN BANKING SYSTEM

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Abstract

The essential component of the actual restructuring process, as a part of the banking system, is the privatization, given the great proportion of state owned commercial banks in the total banking assets, the size of those banks, compared with that of the private owned banks. The reason of privatization derives from the point that private property assures efficiency through managerial initiative, which is

similar with that of the owners, elimination of subsidies and the decision of the pressures exerted upon the budget, and, finally, the decrease of state intervention by imposing objectives without economic justification.

Privatization is, though, not a universal cure, it does not solve in a flash the problem of productivity, which is the key element of the kind of superiority the market economy possess. The actual reforming programs, promoted by the East European countries, and, implicitly, by Romania, intend to surpass, in a fast manner, the historical steps of market economy in order to finally reach over the actual development level of the up most capitalist countries. This fact implies a different kind of reform – the restructuring of economy, that must be undertook in parallel with privatization.

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Componenta esențială a procesului de restructurare actual în cadrul sistemului bancar o constituie privatizarea, dată fiind ponderea băncilor comerciale cu capital de stat în totalul activelor bancare, mărimea acestor bănci comparativ cu băncile private. Motivarea privatizării derivă din ideea că proprietatea privată asigură o eficiență superioară prin oportunitatea inițiativei manageriale, similară cu aceea a proprietarilor, eliminarea subvențiilor şi decizia presiunilor exercitate asupra bugetului şi diminuarea intervenției statului prin impunerea unor obiective fără o justificare economică.

Privatizarea nu este însă un panaceu universal, nu rezolvă de la sine problema productivității, elementul cheie al superiorității economiei de piață. Programele de reformă actuale, promovate de țările est-europene şi, implicit, de România, îşi propun să treacă în ritm rapid peste etapele istorice ale economiei de piață şi să ajungă la etapa actuală de dezvoltare a țărilor capitaliste dezvoltate. Acest lucru implică o altă reformă-restructurarea, care trebuie înfăptuită paralel cu privatizarea. Succesul privatizării depinde în mare măsură de metoda aleasă şi de durata perioadei de aplicare.

Procesul de privatizare a societăților bancare cu capital majoritar de stat este o acțiune complexă, dificilă, care necesită un anumit ritm de desfăşurare, dar care va conduce inevitabil şi în următorii ani la o diminuare treptată a ponderii regimului proprietății de stat în domeniul bancar.

Privatizarea trebuie văzută în strânsă concordanță cu întărirea disciplinei bancare şi cu crearea unei baze solide de capitalizare. Pe de o parte, s-a văzut unde poate duce indisciplina, amestecul politicului şi lipsa de supraveghere din partea autorității monetare în cazul băncilor Dacia Felix, Credit Bank, Columna, Albina, Bancorex. Pe de altă parte, capitalizarea va contribui la sporirea competiției bancare. Acest lucru are un efect pozitiv pentru agenții economici, deoarece ei vor realiza costuri de finanțare reduse şi vor beneficia de o gamă diversificată de produse şi servicii bancare.

Privatizarea şi capitalizarea băncilor trebuie să conducă la crearea unor bănci puternice care să asigure finanțarea economiei şi să nu permită sa se acumuleze noi împrumuturi dezavantajoase. Există o corelație directă între privatizarea băncilor şi managementul acestora, în sensul că privatizarea fără o schimbare a managementului bancar nu-şi are rostul.

Astfel, se pot determina, pe de o parte, traseele urmate de economia națională, luând ca punct de referință anul 1990, iar pe de altă parte, principalele repere ale economiei din prezent şi, de asemenea, perspectivele de evoluție ale acesteia în perioada următoare, elemente ce stau la baza oricărei strategii manageriale într-o bancă.

Contextul începutului de mileniu este totuşi promițător pentru România. S-a demarat astfel procesul de integrare în structurile Uniunii Europene, ceea ce implică deschiderea pe care această perspectivă o presupune din punctul de vedere al activității bancare.

Procesul nu este însă simplu, iar costurile pe care le implică duc la concluzia unei perspective caracterizate prin:

- măsuri de coagulare a procesului de reformă ce vizează eliminarea pierderilor din economie cu consecințe asupra nivelului producției industriale şi agricole;
- orientarea şi deschiderea pieței interne spre țările Uniunii Europene în condițiile lipsei unei protecții a producției interne;
- reducerea inflației prin măsuri în primul rând monetare, ceea ce va determina accentuarea pe termen scurt a fenomenului de criză economică şi socială datorită amplificării sărăciei şi creşterii nivelului şomajului în economie.

Reforma sectorului bancar având drept componentă principală restructurarea acestui sector este absolut necesară pentru sănătatea pe termen lung a economiei şi este condiționată atât de caracterul comprehensiv al procesului în sine, cât şi de necesitatea obținerii simultane, a unui progres substanțial al

ajustărilor structurale din economie. Aceste condiționări fac ca reforma sectorului bancar să fie marcată de progrese cumulative, realizabile pe termen mediu.

Putem spune că sistemul bancar românesc a cunoscut în perioada ultimului deceniu o dezvoltare spectaculoasă, având în vedere situația de la care s-a pornit în anul 1990, caracterizată prin existența unui sistem bancar excesiv de centralizat, majoritatea funcțiilor bancare fiind concentrate în operațiunile Băncii Naționale a României.

Dimensiunea cantitativă a evoluției sistemului bancar din România nu este însă caracteristica principală a acestei perioade. Aparent contrar realității, se poate afirma că principala caracteristică a dezvoltării sistemului bancar românesc a fost coerentă dezvoltării structurale şi calitative a activității băncilor, în sensul direcției ascendente dictate de adaptarea la cerințele economiei de piață. Sincopele constatate pe parcursul acestui deceniu (în ceea ce privește depresiunea evidențiată în activitatea unor bănci-Dacia Felix, Credit Bank sau Columna) nu sunt definitorii pentru întreaga activitate bancară din România.

Aceste elemente de umbră se includ în tabloul general de evoluție a sistemului bancar şi explică, alături de factorii de evoluție pozitivă, imaginea actuală a acestuia.

De asemenea, stadiul de dezvoltare a sistemului bancar românesc este evident determinat de caracteristicile generale ale evoluției economiei în acest deceniu. Se poate astfel spune că sistemul bancar românesc, deşi mult avansat în raport cu celelalte ramuri economice, se află încă în perioada de tranziție, fiind necesare în continuare restructurarea şi dezvoltarea atât cantitativă, sub aspectul creşterii numărului de unități bancare, cât şi calitativă, în sensul perfecționării structurilor de operare şi modernizării activității, implementării de produse şi servicii moderne, care să aducă în egală măsură avantaje băncilor şi clienților acestora.

Astfel, imaginea actuală a sistemului bancar românesc a fost conturată în primul rând de deschiderea economiei romaneşti, fapt ce a determinat ajustarea sistemelor de operare la cerințele şi practicile internaționale. Băncile s-au dezvoltat şi şi-au adaptat oferta în funcție de cerințele impuse de impactul factorilor exogeni asupra economiei reale, precum şi de presiunea din ce în ce mai evidentă a concurenței pe piața financiar-bancară din România.

În consecință, evoluția sistemului bancar românesc s-a caracterizat concret prin dezvoltarea şi diversificarea produselor şi serviciilor bancare, creşterea vitezei şi diversificarea instrumentelor de decontare, modernizarea sistemului de evidență şi control, informatizarea sistemelor de transmitere a datelor de natură contabilă, statistică şi chiar a celor privind procesul de transfer. De asemenea, eforturile de capitalizare precum şi presiunea concurențială au determinat băncile să-şi creeze sau să-şi modernizeze rețeaua teritorială, sistemul bancar fiind, din acest punct de vedere, principalul investitor în construcții din România.

Nu este mai puțin adevărat că evoluția atât de rapidă a sistemului bancar a adus cu sine, în contextul desfăşurării evenimentelor de natură economică, politică, socială sau culturală ce au jalonat traseul României în această perioadă, şi elemente negative care au lăsat o umbră asupra băncilor româneşti, atât pe plan intern, cât şi, uneori, în relațiile acestora cu celelalte sisteme bancare din Europa sau din lume. Din acest punct de vedere se cuvine a se menționa că sistemul bancar este o componentă a economiei naționale, calitatea şi nivelul de dezvoltare ale acesteia determinând, pe de o parte, caracteristicile acestuia, iar pe de altă parte, poziția pe care băncile româneşti o ocupă în matricele de evaluare a riscului operațional pe care băncile şi instituțiile de evaluare financiară le determină.

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30. A DECISIONAL APPROACH IN SYSTEM ANALYSIS

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Abstract

The paper represents an introduction approach to problems specific to economic systems analysis and diagnosis based on decision theory's concepts, methods and models.

The classical ADS steps are presented in an original way based on decisional analysis methodology.

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Apariția unei situații problemă referitoare la starea actuală sau la cea anticipată a unui sistem, constituie o condiție necesară a unui demers de tip **analiză și diagnoză de sistem (ADS).** Acesta vine în întâmpinarea cerințelor managerilor de îmbunătățire a performanțelor sistemelor pe care le conduc, fundamentând, pe baza unei bogate şi argumentate documentări, deciziile acestora. ADS este realizată cu acordul factorilor de decizie, oferind căi alternative de acțiune, cuantificate prin intermediul consecințelor lor probabile/posibile. Ea permite ordonarea acestor căi de acțiune pe baza unei abordări multicriteriale, axată inclusiv pe costurile şi beneficiile estimate. Din acest punct de vedere ADS constituie premisa ştiințifică şi punctul de start al oricărui proces de modelare şi proiectare decizională şi predictivă a unui sistem, în contextul unei abordări sistemice.

Etapele ADS cuprind următoarele faze procedurale:

- formularea problemei prin proceduri de analiză şi diagnoză;
- identificarea, proiectarea şi listarea alternativelor posibile;
- prognoza mediului şi a stărilor viitoare ale naturii;
- construirea modelelor şi utilizarea lor în predicția consecințelor;
- compararea şi ordonarea alternativelor/deciziilor fezabile.

În majoritatea investigațiilor de tip ADS etapele-cadru nu pot fi încheiate printr-o unică parcurgere a lor, fiind necesară reiterarea acestora, proces care are loc datorită nevoii de a colecta noi date/informații despre sistem sau datorită necesității de a formula noi ipoteze. Însuşi procesul de formulare a obiectivelor sistemului necesită reiterarea, datorită apariției efective sau intuirii unor noi restricții legate de consecințele posibile/probabile ale adoptării unei alternative sau a alteia.

Analiza se încheie atunci când reiterarea paşilor ADS nu mai aduce îmbunătățiri semnificative. Decizia finală trebuie să fie prezentată într-o formă adecvată, bine argumentată şi să cuprindă soluții concrete de implementare.

Formularea problemei are în vedere delimitarea conceptuală a acesteia, fixarea contextului, identificarea şi clasificarea obiectivelor şi a restricțiilor, identificarea subsistemelor care vor fi afectate de rezultatele deciziei, relevarea factorilor activi, cu importanță ridicată în funcționarea sistemului.

Identificarea obiectivelor decidentului este un moment important al ADS. Obiectivele/scopurile pot fi *calitative*, în general imprecis definite şi *cantitative*, măsurate cu mai multă exactitate. Obiectivele/scopurile pot fi ierarhizate pe termen scurt şi lung conform sistemului preferențial al decidentului. Ele pot fi modificate relativ uşor în timp şi de aceea o problemă importantă o constituie ***actualizarea*** şi ***predicția*** evoluției lor. Ierarhizarea corectă a obiectivelor permite definirea celor mai adecvate alternative pentru atingerea lor, conform înlănțuirii logice a acestora.

Obiectivul asociat unui criteriu poate avea sensul optimizării (minim, maxim) sau poate fi un obiectiv – țintă, privit ca o consecință din lista acestora, care se urmăreşte a fi atinsă.

Problemele cu care se confruntă decidentul sunt ***multicriteriale*** şi implicit ***multiobiectiv***. Criteriile pot fi independente sau dependente, caz în care este recomandabilă agregarea lor. Fixarea unui obiectiv de nivel înalt în raport cu poziția decidentului poate face inoperabilă definirea şi implementarea unei alternative necesare îndeplinirii lui. Lista alternativelor alese pentru ADS trebuie astfel realizată încât să acopere toate cerințele formulate de obiectivele identificate.

Obiectivele multiple pot fi adesea concurențiale sau chiar conflictuale, o alternativă proiectată în sensul satisfacerii unui obiectiv putând avea efecte contrare în raport cu un alt obiectiv al problemei.

Adoptarea unei decizii (variante, alternative) va fi asociată unei **mulțimi de consecințe**, într-o **abordare multicriterială**, care poate conduce la îndeplinirea obiectivelor sau, dimpotrivă, la nerealizarea lor. Evaluarea unei alternative trebuie să țină seama nu doar de o valoare sau de o consecință, ci de ansamblul acestor consecințe pentru sistem.

Decidentul poate să formuleze el însuşi criteriile sau acestea pot să-i fie sugerate de analist şi în acest context este important modul în care decidentul validează preferențial alternativele. Ordonarea

decidentului este multicriterială, iar soluționarea problemei este în mod evident dependentă de alternativele pe care le ia în considerare.

Evaluarea sau valorizarea consecințelor este, în mod natural, o chestiune subiectivă, decidentului individual sau colectiv revenindu-i rolul esențial în adoptarea deciziei finale.

Scopul analistului este de a face recomandări pertinente factorilor de decizie, pe baza investigației şi a presupunerilor pe care le formulează. În acest mod analistul devine un important ***consultant*** cu atribuții de ***expert***, în procesul de ADS, ale cărui rezultate sunt valorificate ulterior de persoanele cu atribuții decizionale (manageri) pe diferite trepte şi structuri ierarhice ale sistemului analizat.

Restricțiile problemei se referă în principal la alternative şi ele pot fi unele de natură fizică, restricții naturale, altele impuse politic, restricții de resurse umane, financiare ş.a. Anumite restricții/constrângeri sunt cunoscute aprioric, fiind formulate de beneficiarul studiului de ADS, iar altele rezultă pe parcursul analizei. Restricțiile pot fi evidențiate însă odată cu estimarea consecințelor diverselor cursuri ale alternativelor. Mai mult, anumite restricții apar destul de târziu, practic după momentul implementării unei alternative alese. Restricțiile pot avea un caracter general, absolut, sau, dimpotrivă, pot fi temporare şi posibil eliminabile de factorul decizional. În faza de formulare a problemei, pe baza **procesului de analiză şi diagnoză**, nu vor putea fi relevate toate restricțiile potențiale sau efective la un moment dat, acest lucru fiind posibil în urma parcurgerii iterative a tuturor fazelor ADS.

Generarea de alternative în ADS constituie un exercițiu de creativitate şi de imaginație, determinat de o cunoaştere detaliată a problemelor care fac obiectul studiului. Alternativele nu reprezintă doar opțiuni cunoscute decidentului şi analistului la startul ADS; ele vor putea include orice alte opțiuni suplimentare "descoperite", imaginate sau formulate mai târziu. Determinarea unei **alternative fezabile** dintr-o mulțime de alternative formulate constituie o problemă centrală în ADS.

În faza de start alternativele includ toate direcțiile care oferă o şansă parțială sau totală de realizare a obiectivelor, fără a se exclude *varianta nonacțiunii* (alternativa nulă). Majoritatea alternativelor sunt definite şi descrise de decident, celelalte fiind rezultatul activității analistului de sistem.

Mulțimea alternativelor este foarte bogată, iar investigarea tuturor este practic imposibilă sau cel puțin ineficientă. Această mulțime a alternativelor poate fi restrânsă prin ***eliminarea alternativelor dominate****, adică a acelor alternative ale căror consecințe, în criteriile avute în vedere sunt mai puțin favorabile (nestrict) decât cele corespunzătoare unei alternative reținute ca dominantă, oricare ar fi criteriile avute în vedere. Eliminarea alternativelor poate fi făcută şi prin impunerea anumitor criterii şi a caracteristicilor corespunzătoare acestora. Procesul de precizare a mulțimii alternativelor fezabile necesită o analiză detaliată în care se confruntă evaluările actuale şi cele viitoare ale consecințelor, în condițiile în care factorii de risc şi de incertitudine sunt luați în considerare.*

O atribuție importantă ce revine analistului în cadrul procesului de ADS o constituie **predicția consecințelor** asociate mulțimii alternativelor în diferitele **stări ale naturii**, care sunt identificate, sau se presupune că vor fi efectiv realizate în viitor. Incertitudinea domină această fază a ADS, iar misiunea analistului este de a dezvolta cele mai adecvate proceduri orientate în sensul diminuării gradului de incertitudine a sistemului şi a mediului său.

Prognoza consecințelor în viitoarele stări ale naturii dă răspuns concret unor întrebări dificile cum ar fi:

- ce se va obține ca rezultat al unei acțiuni date/abordate ?
- ce se va întâmpla dacă respectiva decizie/acțiune nu va fi luată ?

La niciuna din aceste întrebări *nu poate fi dat un răspuns cert* deoarece stările viitoare ale naturii şi consecințele adoptării alternativelor sunt afectate de factori aleatori.

Orice analiză şi diagnoză de sistem necesită desfăşurarea unor activități de prognoză a elementelor care fac obiectul studiului, în special a consecințelor asociate alternativelor şi a mediului probabil în care va evolua sistemul. În funcție de posibilitățile echipei de analiză este util a se recurge la prognoze complexe, care se finalizează prin definirea nu doar a unei strategii posibile, ci a unui ***scenariu*** care să cuprindă mai multe astfel de strategii, incluse în modele economico-matematice.

O chestiune importantă se referă şi la **prognoza stărilor viitoare ale naturii**. Acest fapt conduce la formularea problemei şi a modelului asociat ei ca un joc între decident, care are la dispoziție mai multe alternative de acțiune (variante) şi natură. Natura este concepută ca ansamblul factorilor exteriori decidentului, care fac ca în urma adoptării unei alternative să se producă nu doar un rezultat ci o mulțime

de rezultate, date, eventual, printr-o distribuție de probabilitate. Prognoza numărului şi tipului stărilor naturii constituie o atribuție importantă ce revine analistului în ADS. În plus trebuie luate în considerare stările naturii indiferent de şansele atribuite realizării lor, oricât de mici ar părea a fi.

Fiecărei alternative îi corespunde un **vector de consecințe** ale căror componente pot fi mai apropiate sau mai depărtate de obiectivele asociate criteriilor avute în vedere. Consecințele pot fi exprimate uneori în termeni monetari (profituri, costuri), alteori nu este posibil acest lucru, fiind întâlnite şi situații în care ele sunt deosebit de dificil de cuantificat. Analistului îi revin responsabilități majore în precizarea consecințelor, evaluarea acestora într-o fază inițială pe bază de experiență, rutină, raționamente, studiul prospectiv al acestora. Analistul trebuie, de asemenea, să poată estima de aici cât timp este necesar pentru atingerea obiectivelor, şi cât timp consecințele estimate vor afecta în sens pozitiv sau negativ obiectivele.

Consecințele viitoare pot fi estimate pe baza investigării corelațiilor de tip prezent-viitor, ale perechilor ordonate alternative – stări ale naturii.

Din multitudinea modelelor disponibile de predicție a consecințelor, cele mai utile în ADS sunt cele matematice, algoritmizate şi programabile pe calculator. Modelele sunt utile dacă sunt validabile şi dacă utilizează informații pertinente, credibile şi folositoare destinației predictive. Nu trebuie însă neglijat nici rolul modelelor conceptuale, bazate pe experiență, intuiție, pe rutina factorilor de decizie şi a grupei de analişti de sistem.

Modelele predictive sunt dezvoltate de asemenea iterativ, iar bucla de tip feed-back asigură rafinarea lor prin selectarea stărilor naturii efectiv importante pentru problema avută în vedere şi adaptarea corespunzătoare a alternativelor identificate la evenimentele relevante.

Modelele predictive sunt afectate de o serie de restricții ce țin țin de validarea acestora cum ar fi:

- cunoaşterea parțială sau oricum limitată a comportamentului sistemului;
- utilizarea unor date nereprezentative (neadecvate scopului analizei şi diagnozei) pentru relevarea unor relații de tip cauză-efect;
- comportamentul imprevizibil al factorilor decizionali ş.a.

Restricțiile pot fi extinse şi la contextul decizional care impune adoptarea unei decizii de grup şi nu doar a uneia individuale.

Rezolvarea problemei printr-o abordare de tip joc este cea mai utilă în acest context. Ea sugerează ideea realizării unui ***experiment*** care să evidențieze cum reacționează sistemul prezent, sau cum va reacționa într-un viitor apropiat atunci când condițiile (contextul) se vor schimba în mod imprevizibil.

În general putem accepta ideea că nici un model nu poate fi complet validat, în sensul identificării output-ului său cu realitatea, sau cu datele reprezentative pentru "istoria" sistemului. Este recomandabilă aici testarea modelului pentru relevarea eventualelor erori, în sensul validării lui pe date deja cunoscute (statistici), nu neapărat pentru a elimina incertitudinea, parte a dinamicii fenomenelor relevante, ci pentru a furniza utilizatorului (beneficiarului studiului ADS) o dimensiune a valențelor şi mai ales a limitelor modelului predictiv.

Dacă alternativa aleasă şi starea naturii care se va produce ulterior au semnificația unor input-uri, consecința corespunzătoare semnifică output-ul acestui context decizional.

Modificarea alternativelor şi evenimentelor poate fi utilizată în scopul studierii senzitivității consecințelor în raport cu input-urile. Studiul acestor corelații de tip input/output poate fi făcut în contextul existenței unor modele analitice. Caracterul probabilistic al corelațiilor relevate complică în mod evident soluționarea modelului ataşat problemei date. Procedurile de simulare stochastică sunt deosebit de utile în rezolvarea acestui tip de probleme.

Dacă presupunem că avem disponibilă matricea consecințelor diverselor alternative într-o analiză multicriterială care conduce la o matrice bidimensională a consecințelor, ne vom ocupa în continuare de **compararea şi ordonarea alternativelor** pe baza datelor disponibile.

Dificultățile ordonării se referă în principal la următoarele elemente:

- o alternativă poate să-şi manifeste superioritatea, în anumite criterii, iar din punctul de vedere al altora ea poate fi nesemnificativă;
- consecințele anumitor alternative nu pot fi în general agregate într-un singur index care să permită aprecierea gradului de atingere a unui obiectiv global;
- preferințele decidentului se pot modifica relativ uşor în timp, în general într-un mod imprevizibil;
- anumite consecințe pot fi evaluate numai în mod subiectiv;

- incertitudinea domină stările naturii viitoare.

Analistul are aici menirea de a studia problema şi de a micşora varietatea consecinţelor, rezumându-se doar la cele mai semnificative pentru alternativele avute în vedere, în contextul unei probleme date.

Raportul ***cost-eficienţă*** este inclus adesea în lista criteriilor necesare ADS. Criteriul este uneori privit cu rezervă deoarece se consideră că eficienţa nu poate măsura corect şi complet valoarea, aceasta depinzând totuşi de decidentul individual, care, la rândul lui poate avea în vedere doar anumite efecte cu caracter secundar. O altă obiecţie se referă la faptul că în sfera costului, privit ca o parte a criteriului cost – eficienţă, se includ doar costurile de input-uri (bani, resurse, timp, manoperă) necesare pentru implementarea şi întreţinerea unei alternative. Dar şi penalizările sau pierderile care însoţesc o alternativă implementată (de exemplu costurile de penalizare pentru lipsa unei mărfi din stoc ş.a.) sunt tot costuri de care nu trebuie făcut abstracţie în analiza decizională a sistemului.

Un criteriu important în studiile de ADS îl constituie, ca o variantă la cel prezentat anterior, criteriul ***cost-beneficiu***. Costurile şi beneficiile, măsurate în unităţi monetare, asociate fiecărei alegeri a unei alternative iau în considerare momentele şi probabilităţile realizării lor. Excedentul beneficiilor totale peste costurile totale este folosit pentru ordonarea alternativelor, făcând apel la tehnicile de actualizare specifice derulării unor fluxuri monetare/băneşti la momente diferite de timp.

Într-o abordare multiatribut a problemei se are în vedere definirea unei funcţii care să modeleze sistemul de valori al decidentului, pornind de la preferinţele sale, de la judecăţile lui individuale, cu toate dificultăţile pe care le implică acest demers.

Construirea unei ***funcţii-valoare multiatribut*** este o chestiune dificilă, iar valoarea ei practică este mai mult legată de comparabilitatea ordonărilor realizate pe această bază, cu ordonările multicriteriale ale problemei investigate.

Alternativele pot fi de asemenea ordonate în contextul identificării mai multor stări ale naturii, pe baza **criteriului valorii monetare aşteptate maxime**. Acest criteriu evaluează pentru fiecare alternativă în parte o sumă a valorilor monetare asociate alternativelor în diferitele stări ale naturii, ponderate cu probabilităţile de realizare a evenimentelor.

Dacă probabilităţile stărilor naturii pot fi estimate, atunci valoarea aşteptată poate fi criteriul cel mai util de ordonare a mulţimii alternativelor. Mărimea valorii aşteptate maxime nu constituie în realitate criteriul decizional agreat de decident într-o problemă concretă care implică riscul într-o proporţie destul de mare.

Conceptul de utilitate, ca expresie a preferinţei decidentului pentru o variantă sau alta, în condiţiile existenţei şanselor de câştig şi de pierdere, relevă comportamentul acestuia faţă de risc.

Asocierea utilităţilor la mărimile consecinţelor alternativelor descrie practic ***atitudinea decidentului faţă de risc,*** diferită în trei situaţii şi anume: ***aversiunea*** faţă de risc, ***înclinaţia*** către risc şi respectiv ***neutralitatea*** faţă de risc. De multe ori decidenţii nu aleg variantele cu valoare monetară aşteptată maximă, iar uneori aleg chiar variante cu astfel de mărimi negative. Un exemplu clasic îl constituie cazul alegerii variantei de asigurare în favoarea celei de neasigurare, deşi din punctul de vedere al valorii monetare aşteptate lucrurile ar trebui să stea invers. Explicaţia constă în faptul că respectivul decident se ghidează în realitate după criteriul utilităţii aşteptate maxime care reflectă de la individ la individ atitudinea/preferinţa sa faţă de risc. În acest context un rol important în procesul de ADS revine analistului de a dezvolta acele proceduri care îl incită pe decident să releve preferinţa sa la risc.

Metodologia decizională dezvoltă în special aceste aspecte ale ADS în care se confruntă şi în final se armonizează opţiuni individuale reflectând diversitatea acestora în ansamblul factorilor de decizie managerială. Analistul este practic un consilier-expert al decidentului, opţiunea finală aparţinând în ultimă instanţă acestuia din urmă.

Analistul poate pregăti variante sau strategii de acţiune, dar nu poate să se substituie decidentului, privit ca principal beneficiar al ADS.

Misiunea analistului nu se încheie însă cu adoptarea deciziei. El îl asistă pe decident în **implementarea deciziei**, îndeosebi în fazele de început când pot apare modificări ale sistemului şi/sau ale mediului acestuia, unele dintre ele imposibil de anticipat. Analistul poate avea atribuţii şi în ceea ce priveşte **evaluarea rezultatelor** acţiunii implementate.

În concluzie, abordarea decizională a problemelor specifice ADS oferă o ***perspectivă*** atât ***descriptivă***, cât şi ***normativă*** pentru eficientizarea structurii, comportamentului şi funcţionalităţii sistemelor economice.

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31. THE GOLDEN TRIANGLE OF INTERNATIONAL STANDARDS OF QUALITY MANAGEMENT SYSTEMS

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Abstract

The advantage of one common language was recognized, already, in the biblical story of the "Tower of Babylon". Since then languages were really confused and people couldn't communicate as one global community. With the economy globalization the need for a common language in trade became a must and standardization developed as an answer.

Following the global success of the ISO – 9000 and ISO 14000 families of standards and the increasing need of companies for a standard that addresses the management of Safety and Health in the workplace, the OHSAS 18000 series of standards were developed. Originally OHSAS 18000 was created from the "British Standard for Occupational Health and Safety Management Systems" (BS 8800-1996) and developed by a group of certification bodies (BSI, BVQI, SGS etc.).

Those 3 families of standards can be looked at, as the golden triangle of Quality Management Systems reflecting the strategic definition of Quality named also as the model of the Quality Stakeholders. Adding to that model the areas covered by those 3 standards, we can realize that when an organization applies them, it covers better the expectations of all it's stakeholders (Fig. 1).

In that paper those 3 standards are explained in more detail and as a summary the future trend of integrating them into one standard is presented.

The golden triangle of quality management standards model is presented as a reflection of the integrated/strategic definition of quality, based on the fact that all 3 standards are aimed to minimize business risks and reflect generic steps of risk management.

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They said, "Come, let us build for ourselves a city, and a tower whose top *will reach* into heaven, and let us make for ourselves a name, otherwise we will be scattered abroad over the face of the whole earth."…… The LORD said, "Behold, they are one people, **and they all have the same language**. And this is what they began to do, and now **nothing which they purpose to do will be impossible for them**. ……. Therefore its name was called Babel, because there the LORD confused the language of the whole earth; and from there the LORD scattered them abroad over the face of the whole earth.
Genesis, Chapter 11

FOREWORD

The advantage of one common language was recognized, already, in the biblical story of the "Tower of Babylon". Since then languages were really confused and people couldn't communicate as one global community.

With the economy globalization the need for a common language in trade became a must and standardization developed as an answer.

Standards influence most aspects of our lives although often their influence is invisible, but if standards would be missing we would notice immediately. As goods are moving across borders we soon notice when what we bought is of poor quality, doesn't fit or is incompatible with equipment we already have.

International standardization began in the electrotechnical field with the establishment of the International Electrotechnical Commission (IEC) in 1906. In the mechanical engineering area standardization was carried out between 1926 to 1942 by the International Federation of the National Standardizing Association (ISA).

In 1946 delegates from 25 countries met in London and decided to create a new international organization with the objective: "to facilitate the international coordination and unification of industrial standards". The new organization, ISO began operating on 23rd of February 1947. Although it's full name is "International Organization for Standardization" it was decided to use ISO as abbreviation which derives from the Greek world 'iso's" meaning "equal".

Between 1947 and the present day ISO published more than 13,700 International Standards but ISO's most widely known standards are ISO – 9000 and ISO – 14000 families of standards.

The majority of ISO standards are specific to a particular product, material or process while ISO - 9000 and ISO - 14000 families of standards are "generic management system standards" meaning that they can be applied to any type of organization no matter size, sector of activity, suppliers of a product or a service, business or non-profit organizations, public organizations or governmental departments.

In 2002 more than 500,000 organization are certified ISO - 9000 standard and almost 50,000 by ISO – 14000.

Following the global success of the ISO – 9000 and ISO 14000 families of standards and the increasing need of companies for a standard that addresses the management of Safety and Health in the workplace, the OHSAS 18000 series of standards were developed. Originally OHSAS 18000 was created from the "British Standard for Occupational Health and Safety Management Systems" (BS 8800-1996) and developed by a group of certification bodies (BSI, BVQI, SGS and others).

Those 3 families of standards can be looked at, as the golden triangle of Quality Management Systems reflecting the strategic definition of Quality named also as the model of the Quality Stakeholders. Adding to that model the areas covered by those 3 standards, we can realize that when an organization applies them, it covers better the expectations of all it's stakeholders (Fig. 1).

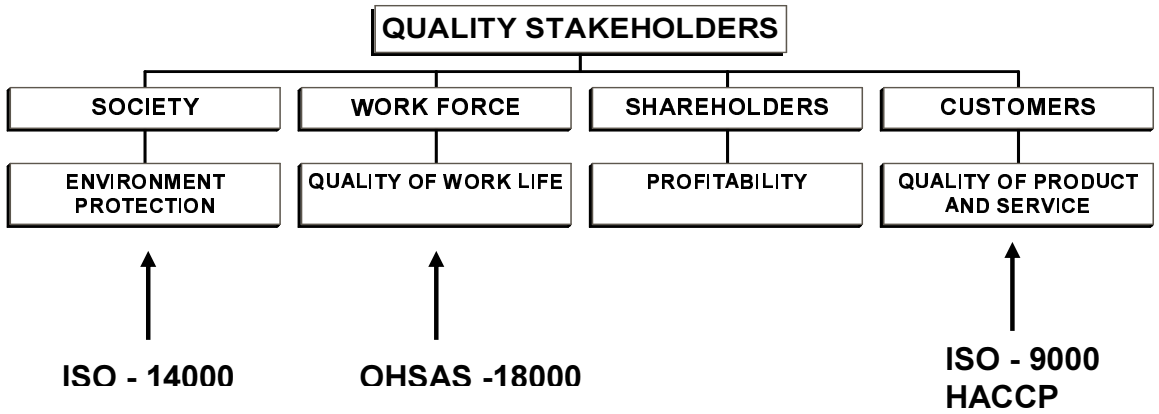


Fig. 1 – The role of ISO - 9000, ISO - 14000 and OHSAS 18000

In that paper those 3 standards are explained in more detail and as a summary the future trend of integrating them is presented.

ISO –9000 : 2000 FAMILY OF STANDARDS

The ISO – 9000:2000 family of standards was developed to assist organizations of all types and sizes to implement and operate an effective quality management system (QMS) and is made up of four core standards:

a. **ISO - 9000:2000 - Fundamentals and Vocabulary –** describes the fundamentals of a QMS and specifies the terminology for a QMS, defining all the specified terms used in the ISO – 9000: 2000 family of standards.
b. **ISO – 9001 : 2000 - Quality Management Systems Requirements** – this is the standard used to certify companies; certification meaning that a certification body verified and approved that the company certified could demonstrate that it implements the basic requirements of the standard that would ensure that the company provides products in conformity with customers requirements and aims to enhance customer satisfaction.
c. **ISO – 9004 : 2000 - Quality Management Systems – Guidelines for Performance Improvements** – provides guidelines for companies to go beyond the ISO – 9001 requirements in order to enhance a continuos improvement process, and to improve the satisfaction of customers and all other interested parties.
d. **ISO 19011 - Guidelines for Quality and/or Environmental Management Systems Auditing** – provides guidance on auditing quality and environmental management systems and is used by internal and external bodies when auditing conformity to ISO –9000 or ISO – 14000 standards.

In addition to those 4 core standards there is a continuos effort to develop guideline type of standards to help those who whish to apply ISO - 9000 standards. As example: ISO – 10015 – Quality Management – Guidelines for training.

As ISO - 90001:2000 is the standard according to which companies are certified it's principles and requirements are fully described in the following paragraphs.

ISO - 9001: 2000 – in the scope of that standard it is stated that the requirements for a QMS as specified in the standard are when an organization:

"a. needs to demonstrate its ability to consistently provide products that meet customer and applicable regulatory requirements,

and

b. aims to enhance customer satisfaction through the effective application of the system, including processes for continual improvement of the system and the assurance of conformity to customer and applicable regulatory requirements."

(Note: in ISO – 9000 : 2000, product is defined as an output of a process, therefore including service).

ISO - 9001: 2000 promotes the process approach when developing, implementing and improving the effectiveness of a quality management system as described in the ISO - 9001's "Model of a process based QMS (Fig. 2).

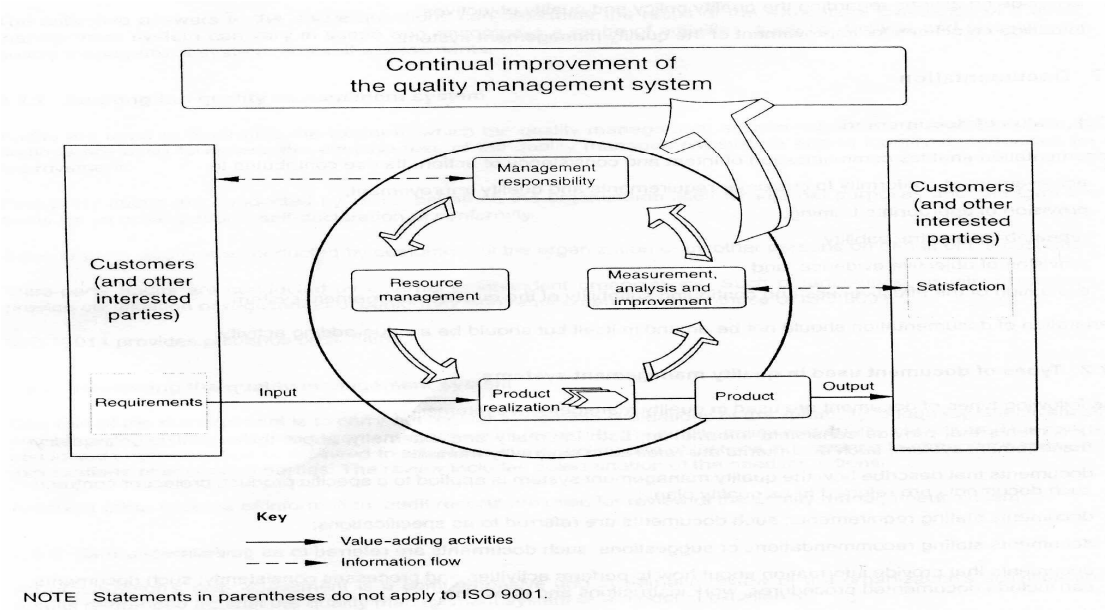


Fig. 2 – Model of a process based QMS, Source: ISO – 9001:2000

ISO - 9001: 2000 is based on 8 principles of quality management:

1. **Customer focus** - organizations depend on their customers and therefore they have to understand their existing and future needs and expectations to fulfill them and to strive to exceed them.
2. **Leadership** – leaders create the unity of the organization's scope. They should develop and maintain an internal atmosphere that encourages employees to be fully involved in achieving the organization's objectives.
3. **Involvement of people** – the people at all organizational levels are the organization and their involvement enables the use of their competence to the organization's benefit.
4. **Process approach** – any result can be achieved with higher efficiency when activities and resources related to the result are managed as a process.
5. **System approach to management** – defining, understanding and managing interrelated processes as a system, contributes to the effectiveness and efficiency of the organization's effort to achieve it's objectives.
6. **Continual improvement** – continuous improvement of all organization's performance should be a constant objective of the organization.
7. **Factual approach to decision making** – effective decision-making is based on data and information analysis.
8. **Mutually beneficial supplier relationships** – the organization and its suppliers are depending on each other and basing the relationship between them on mutual benefit is increasing their ability to create together added value.

Based on the above 8 principles ISO –9001:2000 is structured on 5 main chapters:

- Quality Management Systems (Paragraph 4);
- Management Responsibility (Paragraph 5);
- Resource Management (Paragraph 6);
- Product Realization (Paragraph 7);
- Monitoring and Measurement (Paragraph 8).

ISO – 14000 FAMILY OF STANDARDS

The ISO - 14000 family of standards was developed to assist organizations that wishes to:

"a. assure itself of its compliance with a stated environmental policy; and

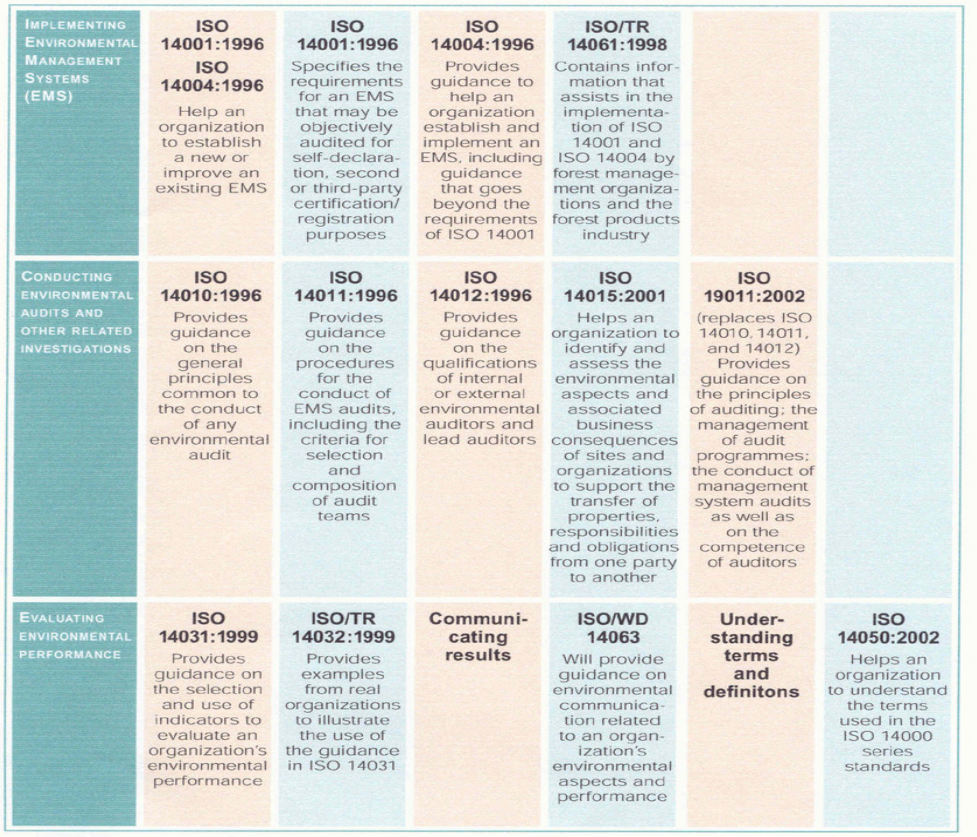
b. demonstrate such compliance to others" (3)

It is important to understand that ISO - 14000 does not state specific environmental performance criteria, but requires organizations to formulate policies and objectives taking into account information about significant environmental effects.

The ISO - 14000 family of standards are applicable at the organization level and at the products and services level.

At the organization level, 3 groups of standards were formed (Fig. 3):

- Standards for implementing Environmental management Systems (EMS);
- Standards for conducting Environmental Audits and other related investigations;
- Standards for Evaluating Environmental Performance.



Implementing Environmental Management Systems (EMS)	**ISO 14001:1996** **ISO 14004:1996** Help an organization to establish a new or improve an existing EMS	**ISO 14001:1996** Specifies the requirements for an EMS that may be objectively audited for self-declaration, second or third-party certification/ registration purposes	**ISO 14004:1996** Provides guidance to help an organization establish and implement an EMS, including guidance that goes beyond the requirements of ISO 14001	**ISO/TR 14061:1998** Contains information that assists in the implementation of ISO 14001 and ISO 14004 by forest management organizations and the forest products industry		
Conducting environmental audits and other related investigations	**ISO 14010:1996** Provides guidance on the general principles common to the conduct of any environmental audit	**ISO 14011:1996** Provides guidance on the procedures for the conduct of EMS audits, including the criteria for selection and composition of audit teams	**ISO 14012:1996** Provides guidance on the qualifications of internal or external environmental auditors and lead auditors	**ISO 14015:2001** Helps an organization to identify and assess the environmental aspects and associated business consequences of sites and organizations to support the transfer of properties, responsibilities and obligations from one party to another	**ISO 19011:2002** (replaces ISO 14010, 14011, and 14012) Provides guidance on the principles of auditing; the management of audit programmes; the conduct of management system audits as well as on the competence of auditors	
Evaluating environmental performance	**ISO 14031:1999** Provides guidance on the selection and use of indicators to evaluate an organization's environmental performance	**ISO/TR 14032:1999** Provides examples from real organizations to illustrate the use of the guidance in ISO 14031	**Communicating results**	**ISO/WD 14063** Will provide guidance on environmental communication related to an organization's environmental aspects and performance	**Understanding terms and definitons**	**ISO 14050:2002** Helps an organization to understand the terms used in the ISO 14000 series standards

Fig. 3 – Application of the ISO - 14000 family of standards at the organization level, Source: www.iso.ch

At the products and services level 3 other groups of standards were formed (Fig.4):

- Standards for using Environmental Declarations and Claims;
- Standards for Conducting Life Cycle Assessment (LCA);
- Standards for addressing Environmental Aspects in Products and Product standards.

USING ENVIRONMENTAL DECLARATIONS AND CLAIMS	**ISO 14020:2000** Provides general principles which serve as a basis for the development of ISO guidelines and standards on environmental claims and declarations	**ISO 14021:1999** Provides guidance on the terminology, symbols and testing and verification methodologies an organization should use for self-declaration of the environmental aspects of its products and services (Type II Environmental Labelling)	**ISO 14024:1999** Provides the guiding principles and procedures for third-party environmental labelling certification programs (Type I Environmental Labelling)	**ISO/TR 14025:2000** Identifies and describes elements and issues for consideration when making declarations of quantified product information based on Life Cycle Inventory data (Type III Environmental declarations)		
CONDUCTING LIFE CYCLE ASSESSMENT (LCA)	**ISO 14040:1999** Provides the general principles, framework and method-ological requirements for the LCA of products and services	**ISO 14041:1998** Provides guidance for determining the goal and scope of an LCA study, and for conducting a life cycle inventory	**ISO 14042:2000** Provides guidance for conducting the life cycle impact assessment phase of an LCA study	**ISO/TR 14043:2000** Provides guidance for the interpretation of results from an LCA study	**ISO/TS 14048:2002** Provides information regarding the formatting of data to support life cycle assessment	**ISO/TR 14049/14047** Provide examples that illustrate how to apply the guidance in ISO 14041 and ISO 14042
ADDRESSING ENVIRONMENTAL ASPECTS IN PRODUCTS AND PRODUCT STANDARDS	**ISO Guide 64:1997** Helps the writers of product standards address environmental aspects in those standards	**ISO/TR 14062:2002** Provides concepts and current practices relating to integration of environmental aspects into product design and development		**Under-standing terms and definitons**	**ISO 14050:2002** Helps an organization to understand the terms used in the ISO 14000 series standards	

Fig. 4 – Application of the ISO - 14000 family of standards at the products and services level, Source: www.iso.ch

Using the PDCA model we can relate the different ISO - 14000 series of standard to the consistent pair ISO -14001 and 14004 as presented in Fig 5.

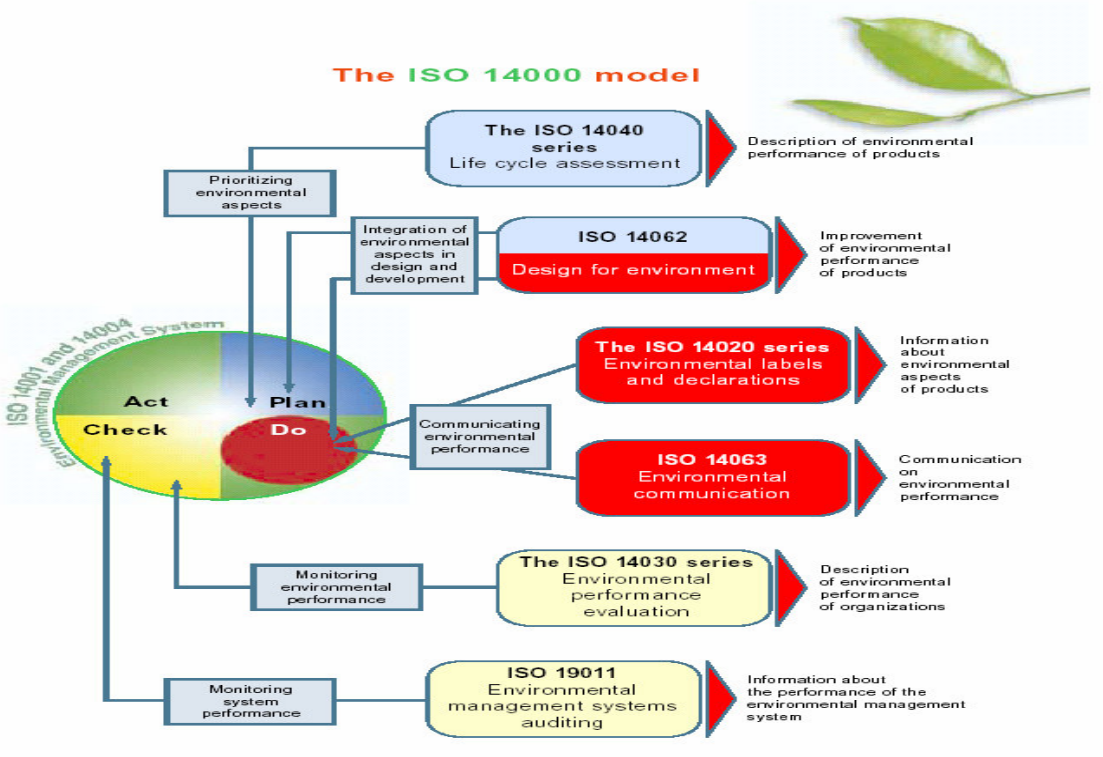


Fig. 5 – The ISO 14000 family of standards (www.iso.ch)

ISO -14001 is based on the PDCA model as presented in Fig. 6 and it's structure follows that model.

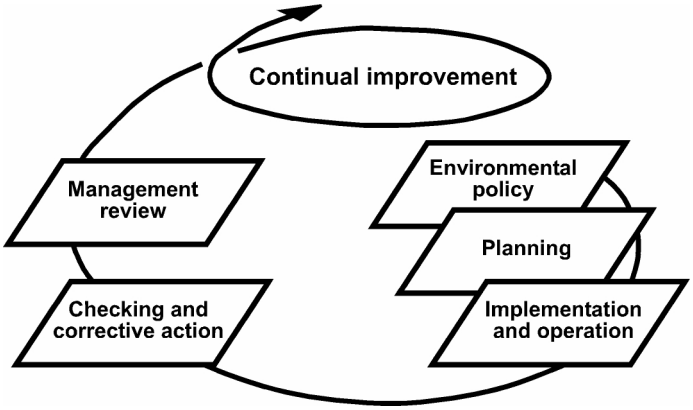


Fig. 6 – Environmental management system model (ISO - 14001)

Following the above model an organization applying ISO - 14001 has to:

1. Define the organization's policy.
2. Plan an environment management system which has to include:
   - procedures to identify environmental aspects;
   - procedures to identify legal and other requirements applicable to environmental aspects;
   - set environmental objectives;
   - establish and maintain a program to achieve those objectives.
3. Implement and operate the environmental plan by:
   - defining roles and responsibilities related to the environmental plan;
   - providing resources needed for the implementation (human, technology, financial, etc.)
4. Train to create awareness to the importance of the environmental aspects and to create the needed competence of the employees to fulfill their tasks related to environment.
5. Document the organization's core elements and procedures of its environmental management system.
6. Establish and maintaining procedures to identify potential accidents and emergency situations and the procedures to respond.
7. Monitor, measure, audit, review (by top management) the activities related to environment and handle nonconformance by corrective and preventive action.

Note: ISO -14001 has an Annex: "Guidance on the use of the specification".

OHSAS 18000 SERIES OF STANDARDS

OHSAS stands for: Occupational Health and Safety Assessment Series and it's two standards OHSAS 18001 and OHSAS 18002:2000 intend to help organizations to control and reduce occupational health and safety risks. That objective is achieved, following the standard, by applying the standard's requirements for an occupational health and safety (OH&S) management system.

The OHSAS 18000 series comprises two parts:

OHSAS 18001 – Occupational Health and Safety Management Specifications.

This is an assessment specification for health and safety management systems. It was developed in response to widespread demand for a standard against which a company could be certified and assessed and could meet it's health and safety obligations in an efficient manner.

OHSAS 18002 : 2000 – Occupational Health and Safety Management Systems Guidelines for the Implementation of OHSAS 18001 - OHSAS 18002 explains the requirements of the specification and guides a company towards implementation and certification.

OHSAS 18001 has been developed to be compatible with the ISO 9001 and ISO 14001 standards in order to facilitate the integration of quality, environmental and occupational health and safety management systems by organizations.

Note: OHSAS 18000 series of standards are not ISO standards; in fact the ISO committees recently voted not to develop an ISO standard related to OH&S, as to their opinion there is no clear demand for it. However, the industry seems to indicate that there is a need for such a standard as an integral component of an Integrated Management System.

OHSAS 18001 is based on the model of OH&S management system (Fig. 7) which has 6 main elements:

1. OH&S Policy;
2. Planning
3. Implementation and operating;
4. Checking and corrective action;
5. Management review
6. Continual improvement

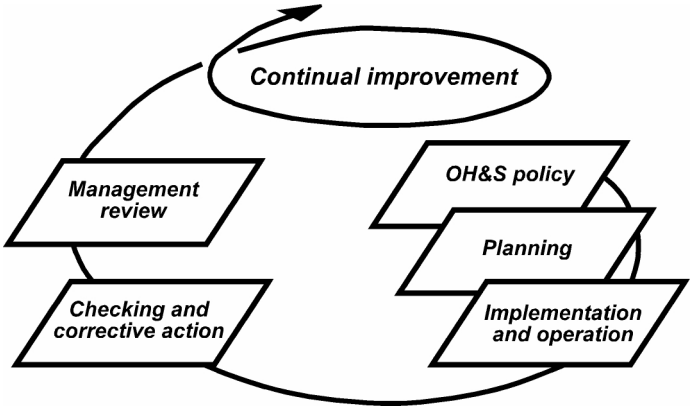


Fig. 7 – Elements of successful OH&S management (OHSAS 18001)

Each of the first 5 elements has a chapter in the standard (continual improvement is mentioned but it hasn't a dedicated chapter), and it's interrelation with other activities is described as a process.

It is helpful to look at all those 5 figures to understand the standards requirements (Fig. 8).

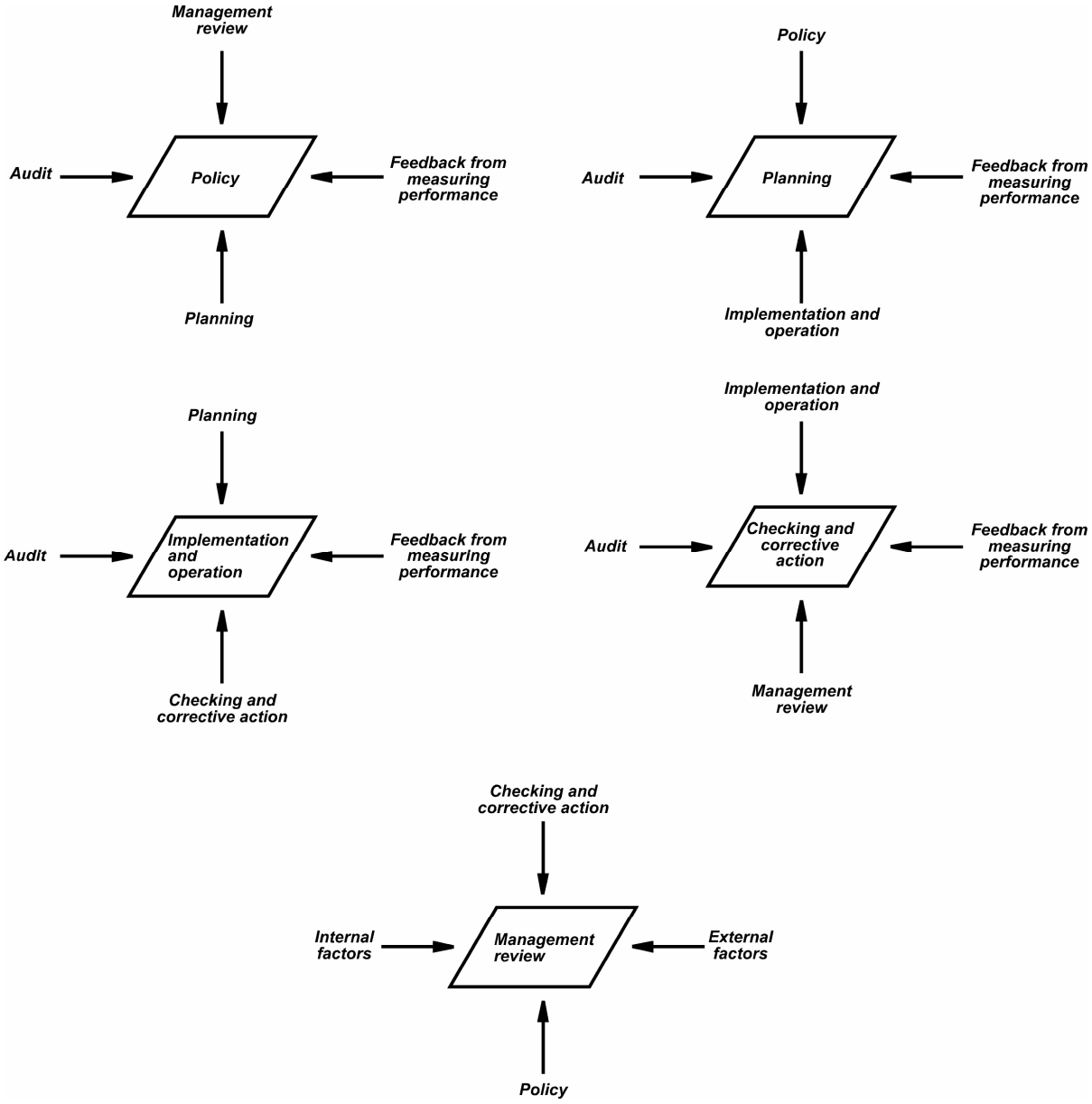


Fig. 8 – The 5 elements of OHSAS 18001 (OHSAS 18001)

INTEGRATION OF QUALITY MANAGEMENT SYSTEMS STANDARDS

In the forward of that chapter the golden triangle of quality management standards model was mentioned as a reflection of the integrated/strategic definition of quality.

All 3 families of standards presented in that chapter are aimed to minimize business risks in the different areas they cover. In all three standards generic steps of risk management can be recognized. Those steps are:

- identification of critical aspects and risks;
- assessment and prioritization of risks;
- determination of requirements;
- implementation of monitoring and control systems.

More than that, all 3 families of standards use two well known management principles:

- PDCA (called Deming Shewart Cycle);
- Process approach.

The combination of those 2 principles is illustrated in Fig. 9.

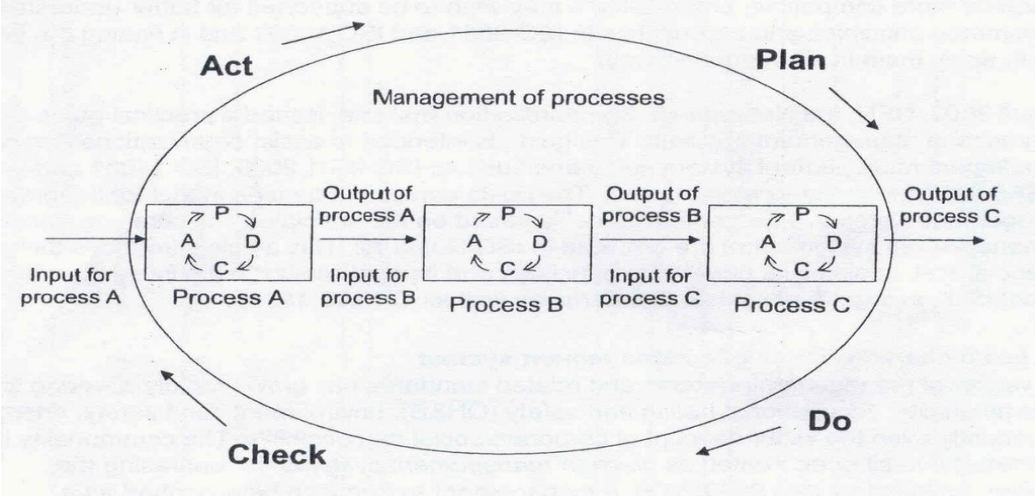


Fig. 9 – Combination of PDCA and process approach (2)

When translating the strategic quality definition into an integrated management system model (Fig. 10) we can detect the focal points for integrated management, and how they are linked to an organization's main processes.

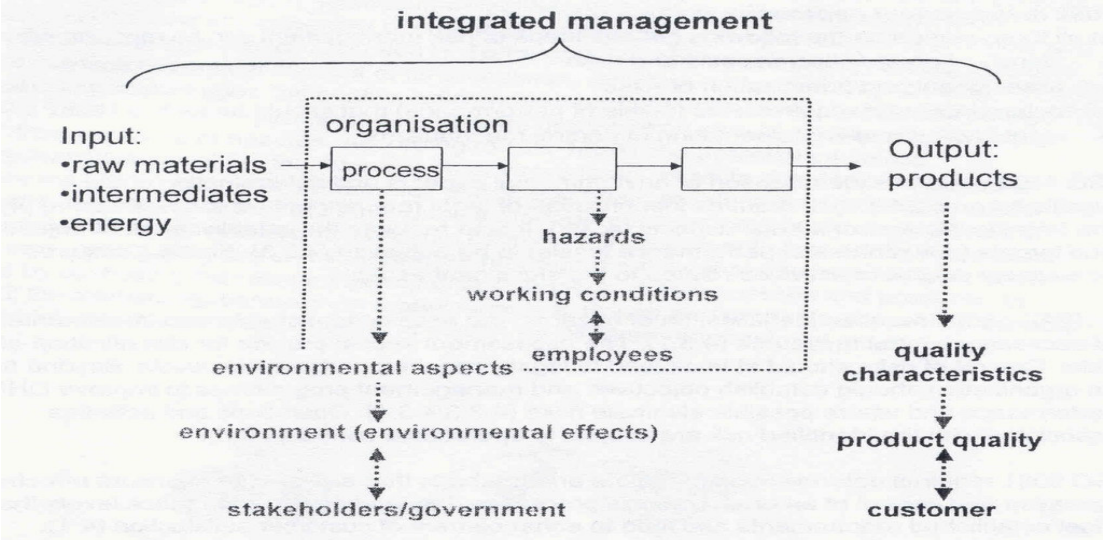


Fig.10 - Focal points (critical aspects) for integrated management related to an organization's processes and products (2)

The above model simplifies the much more complex reality. Environmental aspects are linked also to the products and services delivered by an organization and are influenced by the suppliers through the goods and services used by the organization. In the same way OH&S hazards can be linked to suppliers though materials, equipment etc. purchased and used by the organization.

To conclude the discussion on the need for future integration of those 3 families of standards, ISO – 9000, ISO – 14000 and OHSAS – 18000, into an integrated management system we can use the comparative table developed by the team of NEN (2) demonstrating the similarities in concepts and terms in those 3 standards.

Concept/term	ISO 9001	ISO 14001	OHSAS 18001
Management area	Quality	Environment	OH&S
Primary objective	Enhancing customer satisfaction	Improvement of environmental performance	Improvement of OH&S performance
Primary interested parties (Stakeholders)	Customer Government (regulator)	Government (regulator) Interested parties related to environment	Employees Government (regulator)
Critical aspect (focal point)	Quality characteristic (of products and processes)	Environmental aspects (of activities, products and services)	Hazards (related to the activities and operations within the organization)
Requirements related to the critical aspect (focal point)	Customer requirements Requirements related to intended use Regulatory requirements Requirements determined by the organization	Regulatory requirements Requirements/needs of interested parties Requirements derived from results of risk analysis (environmental aspects analysis)	Requirements/needs of interested parties (employees) Requirements derived from results of risk assessment (hazard analysis)
Management	Processes that are critical for the fulfillment of quality characteristics of products and for the overall performance of the organization related to quality	Operations and activities associated with the significant environmental aspects	Activities and operations associated with the identified OH&S risks/hazards
Results of failing management	Poor performance of the organization, including products that cause dissatisfaction for customers	Harmful impacts to the environment	Harm to the health and well-being of employees
Risks for the organization	Organization cannot fulfill customer and legal requirements Consequences: dissatisfaction of customers, civil liability, criminal offences, decreasing market share and financial losses	Environmental performance (or individual interactions with the environment) that does not meet legal requirements, requirements/needs of interested parties Consequences: criminal offences, civil liability, bad image adn financial losses	OH&S performance and level of control of OH&S risks that does not meet legal requirements or those of employees Consequences: criminal offences, civil liability, loss of work force adn financial losses

Fig. 11 – Corresponding terms and concepts from ISO - 9001, ISO - 14001, OHSAS 18001 (2)

CONCLUSION

In the near future companies will have to integrate in their existing management systems those 3 standards of quality behavior: ISO – 9000, ISO 14000, OHSAS-18000, as part of their thrive for survival in the global competitive environment. Doing so, they will manage better their customers expectations and manage better the risks they face; therefore we were right in naming those standards: “The golden triangle of standards”.

Whatever we do, as managers, to improve our business performance, let’s not forget about the human aspect as so well stated by Juran J.M. in an interview with him from January 2003 (1):

“A scientist is faced with discovering the laws of nature and properties of materials and so on. Engineers, the technologists are faced with utilizing the properties of materials and the laws of nature for the benefit of man. The manager is faced with utilizing the forces of people for the benefit of man.”