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# Risk and Uncertainty, Decisions and Managers

The future is risky – as it is under influence of future factors and circumstances; less known they are, higher the uncertainty, and higher the risk (or probability to fail). On the other side, the decisions are always looking to the future situations. Then *decisions are always risky*. (The debate about decisions made under certain conditions – and how much they can be automated and computerized, and how less they are associated to the rationale, human nature – even challenging, is another topic, for another discussion, at another time...) Hence the key-role played by decision makers at all levels – policy makers, strategists, organization managers.

The recent global financial and economic crisis was having a significant impact on companies, regardless the country, business sector, or size of the company. However, depending on how strong, how sophisticated or how much a national economic system is connected to the global economy, the crisis impact largely varied – mainly as strength and lag time. The crisis has brought not only painful turbulences for most of the world economies but stimulated theoretical research as well. Nassim Nicholas Taleb has written wrote „The Black Swan” in 2007 (before the start of financial crisis in 2008!) warning the bankers about using in excess probabilistic models and missing the possibility of catastrophic events (i.e. „black swans”; the metaphor of „black swans” is used just to define highly improbable events). As Taleb is arguing, the risk models are inherently flawed because they did not and even could not consider the existence of such „black swans” which are „almost impossible to predict [events]. Instead of perpetuating the illusion that we can anticipate the future, risk management should try to reduce the impact of the threats we don’t understand” (Taleb, N.N. *et al*, 2009). The unfamiliar, difficult-to-predict events make the decision process significantly more difficult.





However, beside Taleb's, there were other voices who predicted the financial apocalypse. Many of the elements of the crisis were being signalled pretty long before the crisis happened. What they did not see was how the elements were inter-related; they were simply blind to the risk that the whole system would collapse. One of the major lessons learnt is that risk management is currently switching to risk

managers (CRO = Chief Risk Officer): „clearly, risk officers have a huge role to play, but we don't want to transfer the responsibility for risk from operating general managers to CROs and then feel that the problem is solved" (Kaplan, R.S., *et al*, 2009).

The risk management profession has evolved from a protective function to one that can create value for an organization. The Risk Management Society in its report „The Evolving Role of the Risk Professional" emphasizes that the need for determined and adept risk managers to build risk management capabilities at every level of an organization has become an essential component to organizational success.

This pioneer number of *FAIMA Business & Management Journal* is assembled around the risk idea, from the managers' perspective, as it is discussed by FAIMA scholars and researchers as well as their PhD students, partners, collaborators or invited personalities.

*Prof. dr. Cezar Scarlat*  
*Senior Editor*

# MODELS FOR MANAGING THE RISK OF A PORTFOLIO OF SECURITIES

**Mihai-Dan Gârbea**

WBS Holding S.A.

Abstract

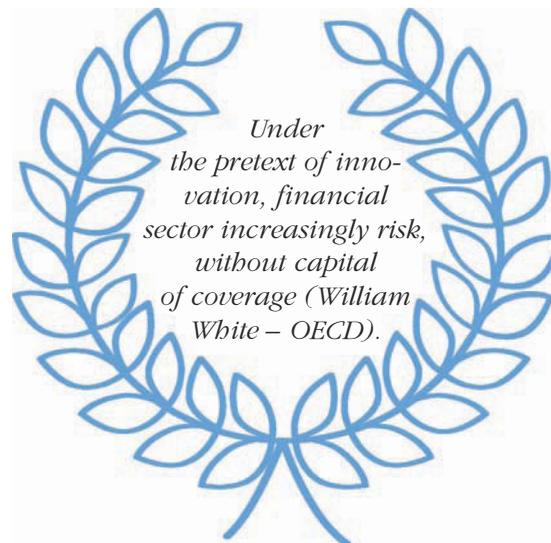
*The goal of this paper is to present how two models that relate risk and return, namely the Capital Asset Pricing Model and the Arbitrage Pricing Theory, apply on the Romanian Capital Market and to compare the two models applied. Two are the objectives of the comparison: to determine which model holds better for the Romanian Capital Market and to determine which model explains more accurately the variation of a certain portfolio of specifically chosen securities. The models can be subsequently used for making investment decisions, taking into account the models' assumptions and the decision-maker's interpretation skills.*

**Keywords:** risk, capital market, regression analysis, CAPM and APT models

There is no unanimity regarding a common acceptance of the definition of risk. On the whole, risk terminology comprises concepts like uncertainty, possibility, doubt, probability, loss, deviation, fluctuation, volatility, expected value, outcome etc. Most of the definitions of risk comprise at least one of these terms and some other ones combined in such a way that almost no definition resembles another one in every respect. There is a handful of permutations of different

concepts, mainly of the ones enumerated above, that make up the vast range of the senses of risk, characterized by dissent.

First of all risk should be discussed in terms of a target, or a reference level, called in statistics and finance expected value. Then, risk should be statistically judged as the variation in the distribution of possible outcomes, where a risky alternative entails a large variance of possible outcomes, related to the target, or expected value. Risk is usually measured by the variance and standard deviation (from the



expected value) and sums up to the area under the normal distribution graph left outside the interval expected by the investor.

Crucial to the notion of risk are the expectations established. Establishing expectations, or calculating expected value, represents the first step towards judging the risk profile of a certain situation, as all other subsequent values calculated and inferences made refer to what is expected. Expectations surround us anytime, anywhere and although we may not verbalize expectations or analyze them in every instance, we are guided by them.

Probability is another central concept to the notion of risk. Decisions needed to be taken in conditions of risk imply a set of defined probabilities for the possible outcomes resulted from an action taken. In case a decision is described by uncertainty, the probabilities of each outcome's appearance are unknown, or sometimes, even the possible outcomes resulted from an action taken are unknown. In the real world, however, the decider will always try to attach probabilities to the possible outcomes of a certain decision, meaning that will always try to frame a decision in risk terms and determine the uncertainty conditions to vanish. That's why estimating and handling probabilities is essential when decisions need to be taken (there is no certain decision, but only risky and uncertain ones).

With the help of probabilities, the most two basic notions that can ascribe a risk situation can be defined, and hence:

- the *expected value*<sup>1</sup> of a random variable is „the sum of the values of the

random variable weighted by the probability that the random variable will take on that value” (Bonini, 1997). It is a weighted average:

$$E(X) = \sum_{i=1}^n X_i * P(X_i)$$

- the *standard deviation* is the square root of the variance:

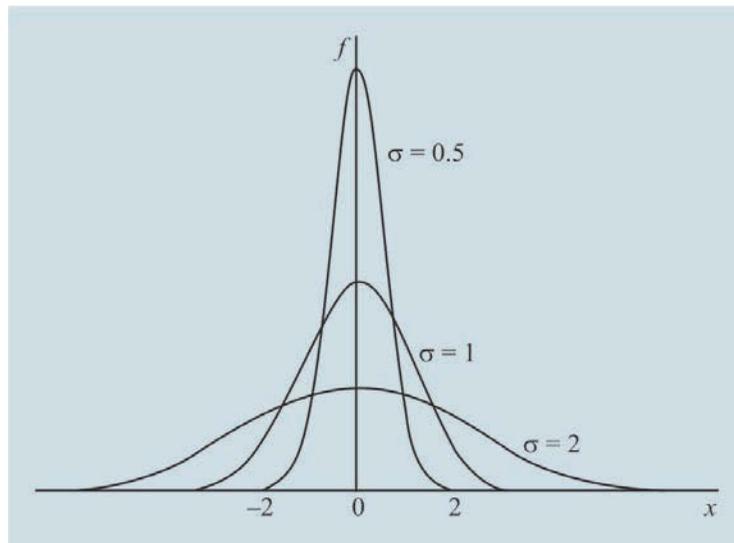
$$\sigma = \sqrt{\sum_{i=1}^n [X_i - E(X)]^2 * P(X_i)}$$

With the help of these two concepts, the *normal probability distribution*, called also the *Gaussian distribution*, can be defined. It has a smooth, symmetric, continuous, bell-shaped curve probability density function. It is a reasonable approximation for enough probability distributions that serve business purposes. However, it should be noted that not every process can be approximated as having a normal distribution.

The area under the curve over any interval on the horizontal axis represents the probability of the random variable X, taking on values in that interval. As with any other continuous probability density function, the area under the curve sums up to 1.

A normal distribution is completely determined by its mean, or expected value (denoted by  $\mu$ ) and by its standard deviation, denoted by  $\sigma$  (once these indicators are known, the shape of the distribution is set):

<sup>1</sup> The expected value of a random variable X with the probability distribution function  $f(X)$  is:  $\int_{all X} X \times f(X) dX$



**Figure 1** – Normal distribution with the same  $\mu$  and different  $\sigma$   
 (<http://www.asp.ucar.edu/colloquium/1992/notes/part1/node15.html>)

One half of the area lies on either side of the mean. The greater the value of the standard deviation, the more spread out the curve. Thus, the standard deviation is responsible for an indicator called kurtosis, which shows the degree of flatness of the distribution. A positive kurtosis indicates a more acute distribution, whereas a negative kurtosis indicates a more flat distribution. Another valuable indicator of a distribution that resembles a normal one, for which the mean of the distribution is responsible, is the skewness of the distribution. It shows the level of inclination of the probability distribution. If the skewness is positive, the distribution is inclined to the right, whereas if the skewness is negative, the distribution is inclined to the left.

With any normal distribution, approximately 99% of the area lies within 2.56 standard deviations from the mean, approximately 95% of the area lies within 1.96 standard deviations from the mean, approximately 68% of the area lies within 1 standard

deviation from the mean, whereas approximately 50% of the area lies within 0.67 standard deviations from the mean. For rigorous predictions in the economic, political and social sciences, a probability of at least 95% is needed (when expressing a certain characteristic of a phenomenon/group), meaning that in the prediction process, which is essential to decisions taken in conditions of risk, a confidence interval is used, which is 1.96 standard deviations away from the mean.

These basic concepts presented so far, along with other ones, such as correlation and covariance, are also used for evaluating the volatility of the securities, or portfolios of securities on the financial market.

Stemming out of these basic concepts, there is in the literature, a handful of models that aim at minimizing the risk of different investments. Two of them, namely the *Capital Asset Pricing Model (CAPM)* and the *Arbitrage Pricing Theory (APT)*, represent the focus of this paper.

Briefly, the two models relate the risk and return of any portfolio of securities and describe the positive dependency between risk and return. First of all, the CAPM provides that  $\bar{R} = R_f + \beta * (R_m - R_f)$ , where,  $\bar{R}$  is the expected return on a security,  $R_f$  is the risk-free rate,  $\beta$  is the beta of the security or its responsiveness to the market movements, and  $\bar{R}_m - R_f$  represents the risk premium on the market.

The APT, on the other hands, provides us with a generalized CAPM formula:

$$\bar{R} = R_f + \beta_1 * (\bar{R}_{\text{factor1}} - R_f) + \beta_2 * (\bar{R}_{\text{factor2}} - R_f) + \dots + \beta_n * (\bar{R}_{\text{factor n}} - R_f),$$

where the betas are the security's sensitivities to the factors and the  $\bar{R}_{\text{factor}} - R_f$  are the risk premiums demanded by the exposed investors in order to assume the risk of investing in the respective security.

In other words, the two models state that the return of a portfolio is positively or negatively correlated (depending on its beta) to the market portfolio (CAPM) or to

different factors (APT), may they be the gross domestic product, the inflation, the foreign exchange rate between two currencies, the price of oil, or any other quantifiable and related factor. Thus, the return on a portfolio is comprised of the return on the risk-free asset (usually T-bills with maturity in 1 year), plus the extra returns of each factor, above the risk-free asset's return, adjusted with the portfolio's corresponding sensitivity coefficients to those respective factors.

The purpose of this paper is to test and compare the CAPM and APT models on the Romanian Capital Market and to conclude which model holds better and which model better explains the variation of the chosen portfolio of securities.

The statistical method used to estimate these beta coefficients between the time series of data (the actual historical returns on the portfolio and the actual historical values of the factors) is called regression. With the help of some computer software programs, that calculate regression, and hence Excel and Matlab, I will estimate the beta coefficients of the portfolio regarding several factors and some other statistical indicators that measure the accuracy of the regression.

„Regression analysis is concerned with the study of the dependence of one variable, the *dependent variable*, on one or more other variables, the *explanatory variables*” (Gujarati, 1988). The dependency between the dependent variable and the independent variable(s) is the  $\beta$  coefficient that has to be estimated for applying the two models on the Romanian Capital Market.



For testing and comparing these two models, that establish a relationship between the risk and return of a financial asset, I will use data on a portfolio of securities listed on Bucharest Stock Exchange and on several factors considered relevant for influencing the return on the portfolio. The data will be considered on a period of 5 years, on a monthly basis (a total of 61 data representing 61 months, that generated 60 entries of relative modifications of the data). It was these 60 entries of monthly relative modifications that constitute the regressed series of data.

The 61 monthly data on different, more or less relevant, factors, about which I will later discuss, were selected from the last transaction day of the respective month, they stand for, or from the last day the data was available for. In some cases, this last transaction day or day for which the data was available was on the 28<sup>th</sup> of the respective months, some other times it was even on the 19<sup>th</sup>, etc.

For the portfolio of securities, as for all the other variables in the models, I selected data on a monthly basis. I have chosen the closing price of the last transaction day of the month or the last day of the months for which data was available. The portfolio chosen comprises of 5 securities listed on Bucharest Stock Exchange, each with a 20% weight:

- Antibiotice SA (ATB)
- Banca Transilvania SA (TLV)
- Electroputere SA (EPT)
- Policolor SA (PCL)
- Rafinaria Astra Romana SA (ASP)

As regards the market return variable necessary for the CAPM and which I used for the APT also, I have chosen the monthly data for the BET-C variable, at the closing price, during the period specified. The BET-C variable represents the whole transacted market on Bucharest Stock Exchange and takes into account each security's value according to its weight.

For the APT estimation I have used, except for the BET-C explanatory factor, which represents the market return, 3 other additional factors, that I considered relevant for explaining and determining the market return variation of the selected portfolio:

 A factor I considered important in influencing the return on my selected portfolio is the ROL/USD foreign exchange rate. That's why I chose the ROL/USD foreign exchange rates during the same period.

 Another factor that I considered even more influential on the selected portfolio's return is the GDP variation. Because there is no monthly data on GDP, I approximated this factor with the industrial production (IP), for which monthly data exists. This is, however, less influential on the selected portfolio's return, than the GDP, as it focuses only on the industrial contribution to the formation of the gross domestic product, ignoring important contributions to the GDP formation, like that of services.

 Finally, I have considered inflation as another, very important influential factor on the selected portfolio's return. For this reason, I have taken into consideration the consumer price index (CPI) and its monthly relative modification during the envisaged period.

The last variable necessary for estimating the CAPM and the APT is the risk-free rate ( $R_f$ ). This basically represents the rate of return that bears 0 risk. The only rate of return that bears 0 risk, at least not in crisis conditions, is the T-bills' rate of return. Because the data on the T-bills' rate of return doesn't go back until 1999 and the reference interest rate, which would have been a representative estimator of the risk-free rate, was not calculated by NBR (National Bank of Romania) before 2002, I have chosen the BUBID and BUBOR interest rates.

BUBID and BUBOR refer to the inter-banking interest rate and stand for Bucharest Bid and Bucharest Borrow respectively. BUBID and BUBOR rates are calculated for different periods of time: 1 day, 1 week, 1 month, 3 months, 6 months, 9 months and 12 months respectively. To best estimate the  $R_f$ , I have chosen the BUBID and BUBOR rates at 12 months (for the longest period possible, approximately as long as the average period on which investments in T-bills are made) and averaged them with equal weights, of 50% for each.

A summary of the results, as well as an interpretation of the results, obtained with the help of the regression method is presented below:

From the data obtained, the equations of CAPM and APT can be deduced:

- CAPM:

$$R_p - R_f = 0,03066824 + 0,79445269 (R_m - R_f)$$

- APT:

$$R_p - R_f = 0,0208995 + 0,6639762 * (R_m - R_f) + 0,4495388 * (R_{usd} - R_f) - 0,0048509 * (R_p - R_f) + 0,0946558 (R_{cpi} - R_f),$$

where  $R_p$  represents the rate of return on the portfolio,  $R_f$  represents the risk free rate (BUBID-BUBOR),  $R_m$  represents the rate of return on the market (BET-C),  $R_{usd}$  represents the ROL/USD foreign exchange rate,  $R_p$  represents the industrial production (a substitute for GDP) and  $R_{cpi}$  represents the inflation (consumer price index). All these values are calculated in relative terms (monthly relative variations).

The interpretation of these equations is as follows:

- For CAPM: the variation of the mean return on the portfolio, less the risk free rate, is explained in a proportion of 79,45% by the variation in the market return, less the risk free rate.
- For APT: the variation of the mean return on the portfolio, less the risk free rate, is explained in a proportion of 66,4% by the variation in the market return, less the risk free rate, when the other explanatory variables are held constant. Similarly, the variation of the mean return on the portfolio, less the risk free rate, is explained in proportions of 45%, 0,5% and 9,47% by the variations of the foreign exchange rate, industrial production and inflation respectively, less the risk free rate, when the other explanatory variables are held constant.



	CAPM	APT
R Square	0.31777537	0.3691236
Adjusted R Square	0.30601287	0.3232416
T test for intercept	1.92512025	1.203643648
T test for 1 <sup>st</sup> variable	5.197690485	3.918251504
T test for 2 <sup>nd</sup> variable		0.707472463
T test for 3 <sup>rd</sup> variable		-0.023424565
T test for 4 <sup>th</sup> variable		0.134557143

The most important indicator is the R squared, which basically measures how well the sample regression line fits the actual data of the dependent variable. „ $R^2$  measures the proportion or percentage of the total variation in Y explained by the regression model.” (Gujarati, 1988).  $R^2$  is also known as the coefficient of determination and it is the most commonly used measure of goodness of fit of a regression line.

In order for a comparison between two  $R^2$  of two models with the same dependent variable but with a different number of explanatory variables to be correct, one must

take into account the number of X variables present in the model. Put differently, one has to discount the two  $R^2$  calculated for two models with the same dependent variable, but with a different number of explanatory variables, by the number of explanatory variables encapsulated in the model. This can be done with the help of the adjusted R squared.

The following table shows how the  $t$  value obtained with the help of the regression method is compared with its corresponding value in the t-distribution table and how the decision of rejecting or not the null hypothesis is taken:

<i>The null hypothesis:</i>	<i>The alternative hypothesis:</i>	<i>Reject the null hypothesis if:</i>
$\beta_n = 0$	$\beta_n \neq 0$	$ t  > t_{\alpha/2, df}$

The approach of the t-test is similar to the confidence interval approach and is meant to test the possibility of a certain coefficient to be different from the estimation made by the regression method.

The first thing one should note is that the  $R^2$  (both the adjusted and the unadjusted one) is bigger in the APT case, than in the CAPM case. This result confirms my expectations, as it is logical that, between two explaining models, the one taking into account more variables, has a greater explanatory

power than the one taking into account only one variable, even though that variable (in this case the BET-C index) has the greatest influence on the factor explained by the models (the return on the portfolio).

Not only that the difference in the  $R^2$  values is not very large (not to say insignificant), but this difference diminishes, when the regression is explained in terms of adjusted  $R^2$  values. Thus, because of the discount of  $R^2$  by the number of variables encapsulated in the model, the adjusted  $R^2$

values resulted are closer one to another than the  $R^2$  values. Put in relative terms, the adjusted  $R^2$  value in the CAPM case is only 3.70% less than the  $R^2$  value, whereas the adjusted  $R^2$  value in the APT case is 12,43% less than the corresponding  $R^2$  value. Therefore, it can be concluded that, the explanatory power of the APT model on the return of the portfolio, although it increases, doesn't increase at the same pace as the  $R^2$  increases (it is inflated by the number of explanatory variables used in the APT model).

Thus, although the APT explains better the variation of the return of the portfolio in real, comparable terms (adjusted  $R^2$  terms), the additional explanatory power of the additional variables (ROL/USD exchange rate, GDP and inflation) is only modest as compared to the explanatory power of the BET-C factor.

In the CAPM case, the t-test tells that the null hypothesis ( $\beta$  is 0) can be definitely rejected for a probability of 95%, since the

module of the t-test value is way larger than the value from the *t distribution table* (2,00) and the t-test becomes statistically significant in this case. It is not the case of the intercept's coefficient, whose t-test module value is less than the value from the *t distribution table*. The t-test is, in this case, statistically insignificant and the null hypothesis can be accepted (a may be equal to 0, but not necessarily) for a probability of 95%. However, for a probability of 90%, the t-test for the intercept's coefficient becomes statistically significant as its value is greater than the one in the *t distribution table* (1,671) and the null hypothesis, that  $\alpha = 0$ , may be rejected.

It should be noted, that the t-test's result for the null hypothesis, regarding the intercept's coefficient (that may be equal to 0), for a probability of 95%, is an argument in favor of the assertion, that the CAPM holds on the Romanian market (at least for the selected portfolio).

Similarly, in the APT case, for a probability of 95%, only the null hypothesis for the b coefficient of the market return variable (BET-C) can be rejected. In this case, the t-test is said to be statistically significant. In all other cases, including the intercept coefficient's case, the null hypotheses can be accepted (the b coefficients and a can be equal to 0 for a probability of 95%). Thus, for a probability of 95%, the APT may hold on the Romanian market, taking into account the selected portfolio and explanatory variables.

As a final conclusion to what I have discussed so far, perhaps surprisingly, the constructed CAPM and APT models (especially



the APT) may hold on the Romanian market, taking into account a probability of 95% for the t-tests of the intercepts' coefficients. However, because the absolute values of the t-tests are closer to the critical limit (although below), above which the CAPM and the APT wouldn't hold anymore (2,00), than to 0 (value at which the CAPM and the APT would perfectly hold), it is more probable that the CAPM and APT wouldn't hold, than that they would. In other words, the final conclusion says that, there is no certainty that the CAPM and APT wouldn't hold and that there is a possibility that they actually would, although the probability that they would hold on the Romanian market is smaller than the probability that they wouldn't.

Moreover the APT holds better on the Romanian market, both because the t-test value of the intercept's coefficient is smaller and for the fact that its adjusted  $R^2$  is bigger.

Thus, the null hypothesis (that  $\alpha$  is 0) can be accepted in the APT case with only a much smaller probability (70%-75%) than in the CAPM case (92%-93%). In other words, it is more probable that  $\alpha$  is 0 in the APT case than in the CAPM case. Also, the fact that its adjusted R square is bigger is an argument for the APT to be chosen (for the factors chosen) instead of the CAPM, because of its greater explanatory power. The APT model should be, therefore, chosen for making investment decisions on the Romanian Capital Market and for managing a certain portfolio of securities.

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# LIMITING THE CONSEQUENCES OF ACCIDENTS

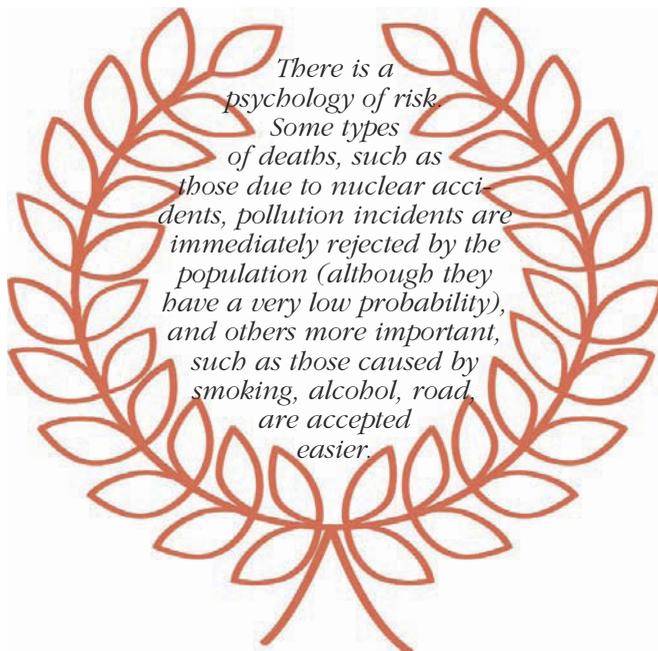
Anca Alexandra Purcărea\*, Florin Dănalache

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## Abstract

*The study represents the result of a scientifically research effectuated on contract basis. The main goal is to determine the needs and identify the best way of briefing for civilian population in order to prevent and limit the consequences of major accidents caused by dangerous substances.*

**Keywords:** market research, sampling process, dangerous substances



## General Context

The environment and industrial safety represent world problems and particularly essential problems for the countries in Central and Eastern Europe. The European Community Legislation (mainly as a result of SEVESO Treaty) imposes more and more constraints on manufacturers, asks for technological efficiency in order to control and oversee the sources of pollution, therefore controlling the impact on the environment.

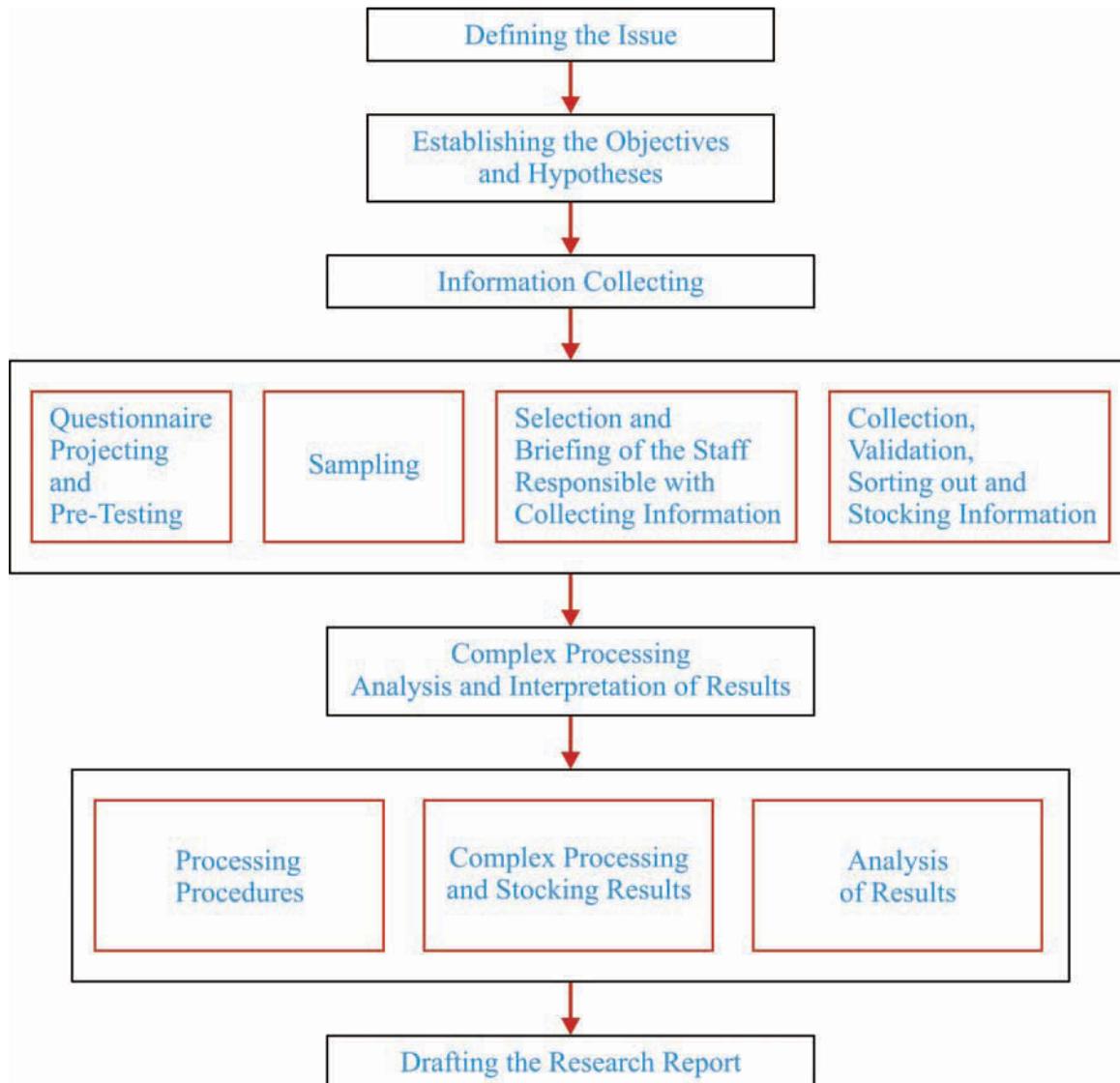
Within our country there are systems for detecting and local monitoring the noxae, yet there is necessary a system of preventing, forecasting and assisted decision, with informing the decision factors able to take into account the industrial risk, the variety of

regional factors, such as relief and meteorology. The system should allow informing in real time the decision factors at territorial level in order to take the most propitious decisions, as well as the civilian population, such that the consequences of accidents caused by dangerous substances be limited. In order to identify the best methods of briefing the population, there was carried out a market research.

## The Market Research Process

The project of a research should be based on a correct identification of the subject, the exact establishing of the objectives to follow and, selecting the measurement instruments appropriate to the respective case.

The market research process is represented within Figure 1.



**Figure 1** – Market Research Process

## A. Preliminary Investigation

In order to elaborate the objectives and hypotheses of the research, as well as verifying the research hypotheses, there was necessary to carry out a **primary research** by means of the depth interview. The selected sample was small and comprised 10 persons aged over 18, having a constant monthly income. Said persons were aleatory selected, irrespective of sex and professional training.

The sample is not representative from the statistical point of view.

### The way of carrying out the interview

The interview was carried out at the residence of the subjects, and each interview lasted for about 20–30 minutes. The interview (dialogue) was not recorded, the person who took it memorized the answers and re-wrote them, in the absence of the interviewed subject and, in the end, the content was analyzed. The operator was able to clarify a series of questions with a higher degree of complexity, offering the subjects explanations and guidance concerning the aspects to be taken into account, therefore correct answers were obtained.

#### Approaching guide:

- discussion on pollution;
- discussion on the effects of pollution;
- mentioning of the last date when the subject was aggressed by pollution;
- discussion on the use of internet;
- discussion on the use of internet in view of briefing.

The themes were brought into discussion unless the subject failed to refer to them during his spontaneous speech.

There were ascertained the followings:

- There are no briefing programmes for civilian population;
- Most of the civilian population does not know how to act in case of major accidents caused by dangerous substances;
- Most of the population is not aware of the effects of pollution caused by dangerous substances;
- There are persons considering that they do not have any individual obligation with respect to polluting the environment.

Starting with defining the issue to be searched, there was drafted a series of hypotheses allowing to define the research objectives.



## Statistical hypotheses and the objectives

- H<sub>0</sub>:** There is a connection between the education level of the population and the way of understanding the effects of accidents caused by dangerous substances.
- H<sub>1</sub>:** The different age levels do not exert a significant influence on Internet briefing of the population.
- H<sub>2</sub>:** At most 50% of the population knows that there is the possibility of Internet briefing.
- H<sub>3</sub>:** At most 60% of the population is aware of the effects of accidents caused by dangerous substances.

The objectives of the research carried out by researchers are presented.

1. Knowing the population opinions on the effects of major accidents.

2. Determining the proportion in which the population is aware of the effects of major accidents.
3. Determining the proportion in which the population knows how to act in case of major accidents.
4. Determining the degree in which the population considers briefing as important.
5. Knowing the population attitude given briefing by Internet.
6. What other briefing means are useful for the civilian population.
7. Knowing the way in which population becomes involved in case of major accidents.
8. Determining the degree in which the population uses the acquired knowledge.
9. Identifying the population given age, sex, profession, income and the way they influence the availability to access to information by Internet.

## B. Drawing of the Research Plan

On account of the data acquired within the semi-structured depth interview, there was started the projecting of the questionnaires addressed to the civilian population. In this regard, the researchers were able to simplify a series of questions with a higher complexity degree.

The selected **research method** was the structured-type inquiry, and the used **contact method** was the personal interview. It was projected a questionnaire-type which was filled in by the interview operator, on account of the answers from the interviewed persons. The average time for work/natural person questionnaire was of about 20 minutes.



The **sampling process** was focused on determining the structure and dimension of the sample, such that to be representative for the studied collectivity.

In this regard, as the potential users of the analyzed service are natural persons from different regions in the country, the sample comprised exponents from a single town in the country, where the possibility of producing a major accident is acknowledged, and the obtained results will be extrapolated.

Taking into account the fact that the civilian population which needs to be trained in case of a major accident cannot be categorized as only of male sex or young people, we will agree that the studied population represents the population of the entire town of Craiova. Craiova is a town of about 300,000 inhabitants.

### Establishing the sample size

For determining the sample size in case of an aleatory sampling, it was considered both the level of predicting the estimate (the allowable error), and the trust interval.

It was considered an allowable error level of  $\pm 3\%$ , for a trust level of 95% to which it corresponds the value of 1.96, according to the Z distribution table. It is considered that p (the percentage of those answering by „Yes”) will be of 50%.

$$\text{The size of the sample is: } n = \frac{Z^2 \times p \times q}{E^2},$$

where  $Z^2$  represents the square value of the Z coefficient corresponding to the trust level; p represents the estimate of the percentage in case of success; q represents the estimate of the percentage in case of failure; E represents the level of the allowable error.

$$\text{Thus: } n = \frac{(1,96)^2 \times 50 \times 50}{3^2} \approx 1067.$$

Given financial and time reasons, the real research will be carried out on a sample of 50 persons.

The error will be of:

$$E = 1,96 \sqrt{\frac{50 \times 50}{50}} = 13.85.$$

### Selecting the observation, sampling and analysis unit

The sampling unit is represented by an element or a group of elements which can be selected to form the sample. As sampling unit there was selected the individual (the person). From the sample units there can be obtained information on account of which there will be drawn the conclusions valid for the entire considered population.

For the selected theme, the appropriate sampling method is the stepped-sampling method.

The stepped-sampling method requires covering certain successive stages called steps. A first step in case of the present study is represented by selecting the districts from Craiova that were selected for said sample. This thing will be realized by calculating 15 % of the total number of districts in Craiova, which is 12.

The obtained result is 1.8, which approximately means selecting two districts of Craiova. By using the aleatory simple sampling, we selected *Baba lui Novac* and *La Ciuperca* Districts. The following step comprises 15% of the total number of streets in the two selected districts. In *Baba lui Novac* district there are 56 streets, and in

*La Ciuperca* district there are 36 streets. By calculating the 15% percentage of the total number of streets of each district separately, we reached to the conclusion that the study should comprise about 8 streets from *Baba lui Novac* district and 5 streets from *La Ciuperca* district.

Thereafter, from each selected street, we aleatory selected one building of the total number of buildings. From each street from *Baba lui Novac* district and *La Ciuperca* district we aleatory selected one block of flats. We continued with simple aleatory sampling as about the flats selected in the above-mentioned blocks of flats. From the total number of persons in each flat, we questioned a single person aged over 18.

Therefore, after combining the stepped-sampling method with the simple aleatory sampling method, there can be established the representative sample for the research taken into account, regarding the population attitudes and opinions on the danger represented by major accidents caused by dangerous substances.

Finally, the sample comprised a number of 50 households selected at random,

according to the presented methodology. The representativity of the sample is ensured by the fact the each person has the same chance as the rest to be included within said sample, the subjective elements of favouring certain persons during the selection operations being reduced at minimum, by aleatory selecting which uses the drawing lots principle.

A limit of the allowed error of 3% would have better ensured the representativity of the sample. Reducing the sample to 50 persons guarantees, therefore, the representativity of the sample, with a  $\pm 13.85\%$  error and, with a trust level of 95%.

By combining the stepped-sampling method with the simple aleatory sampling method, adapted to the present study, the representativity of the sample is ensured, from the point of view of its structure.

Given the main methods of communication with the subjects, there was selected the method of inquiry based on interview.

### **Recommended methods meant to lead to reducing aleatory error and systematic errors**

The aleatory error is due to the variability of the chances to belong to a sample. Such errors are unavoidable as long as the sample is not increased. The aleatory errors are mainly unavoidable as long as we have a relatively reduced sample, of 50 persons. The systematic error is generated by factors connected to the imperfection of the sampling process. The systematic error with respect of the answer is manifested when some of the subjects give answers that do not correspond to reality. There could arise



consent errors (when the respondent answers with „yes” to any question), as well as social representation errors (when the subjects wished to create a favourable image for maintaining their prestige).

not try to manipulate thereof. At the same time, the obtained information remain confidential and, they will not be used in other purposes, except for the declared ones.

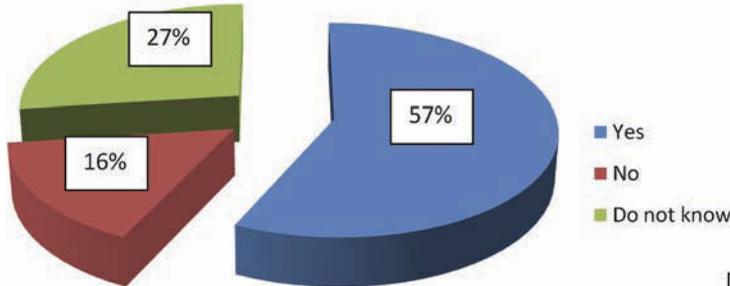
### The Ethics of the Research

It is ascertained that the carried out market research observed the ethics regulations, as it did not harm in any way the values of the interviewed persons and, it did

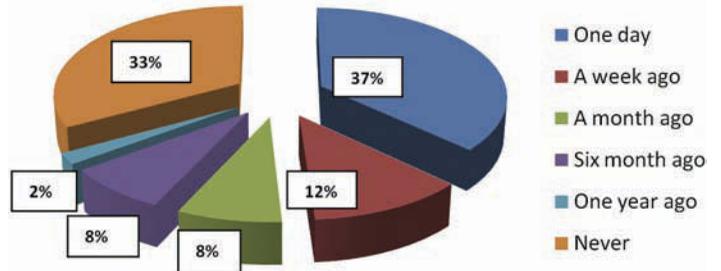
### The Results of the Market Research

Within the Diagrams presented below, there are represented the statistically processed answers to the questions addressed to the subjects selected from the civilian population.

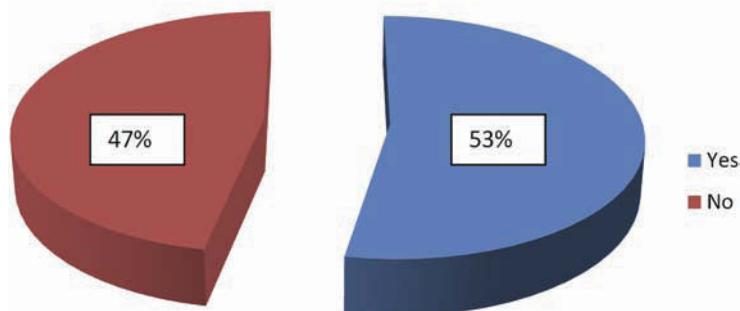
Do you think that you live in an area exposed to pollution caused by dangerous substances?

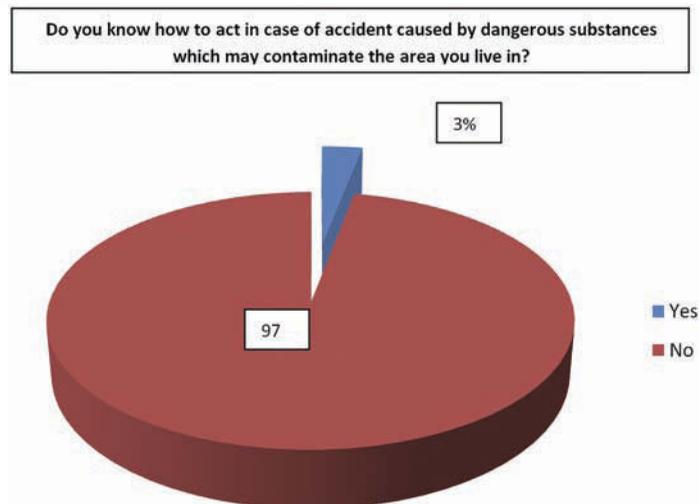
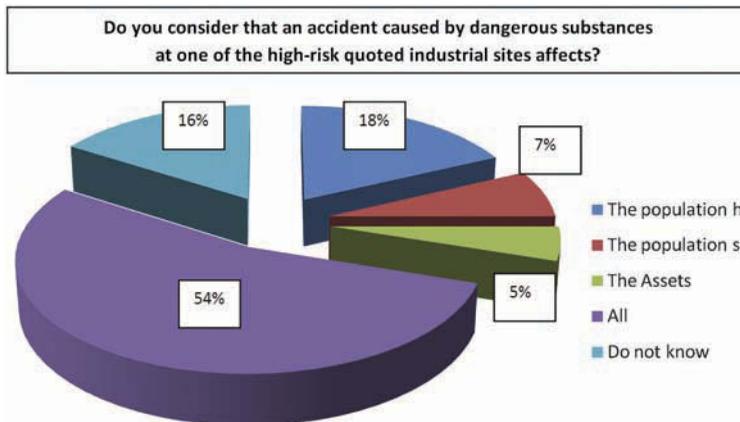
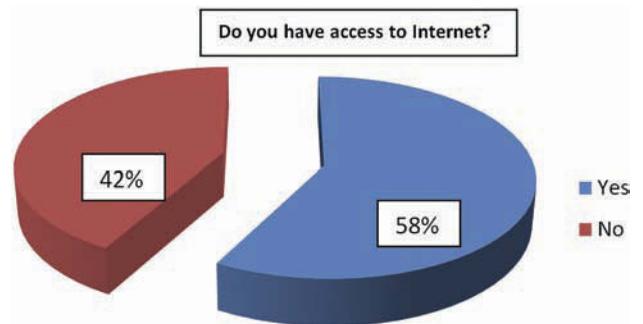
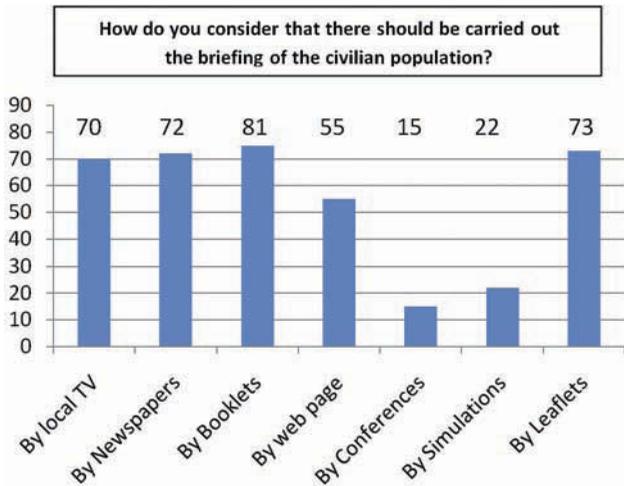


When did you last access the Internet to gain information?

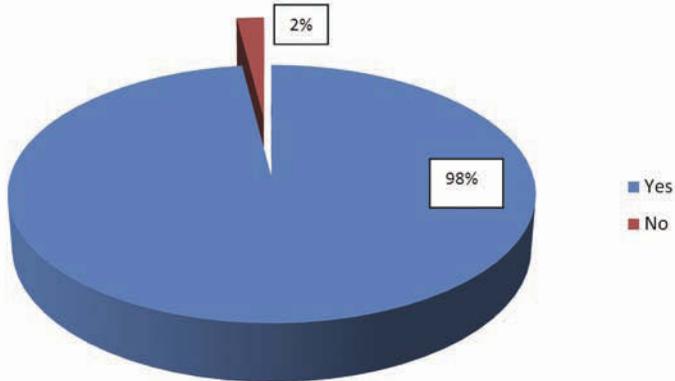


If there were briefing information on a web page and this were disseminated in press, would you access them?

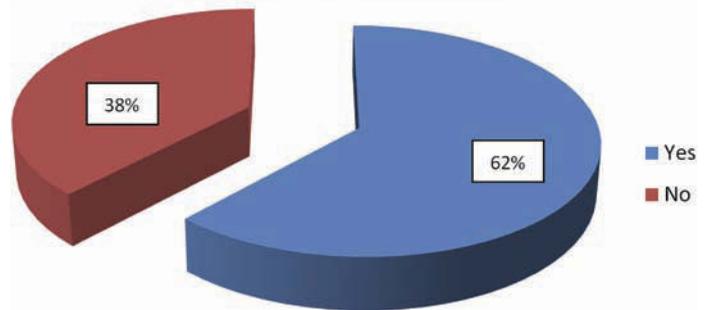




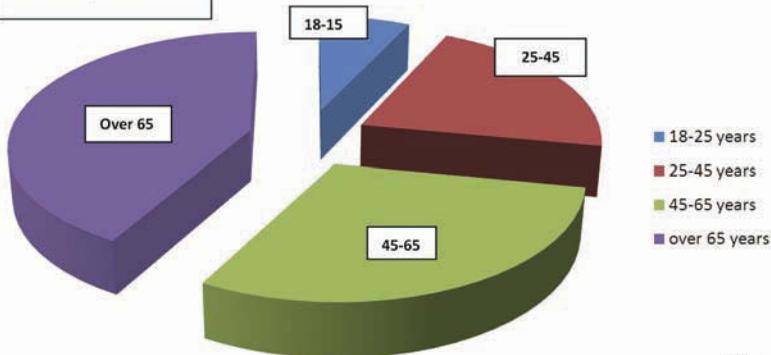
Do you think that a programme of briefing within civilian population, in view of acknowledging the necessary measures to be taken in case of accident caused by dangerous substances, is required?



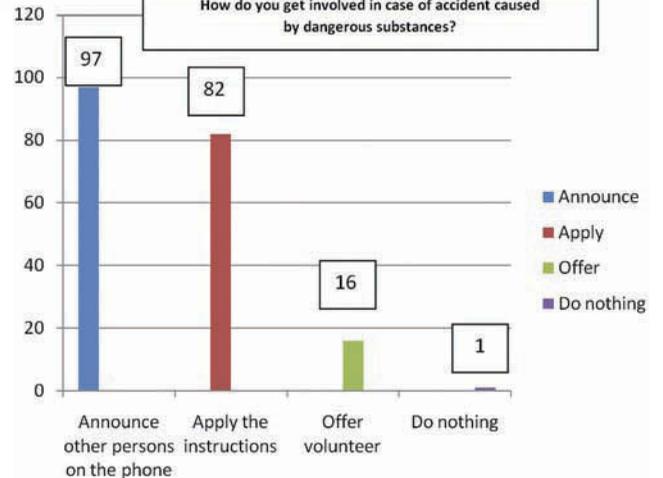
Do you have access to a computer?

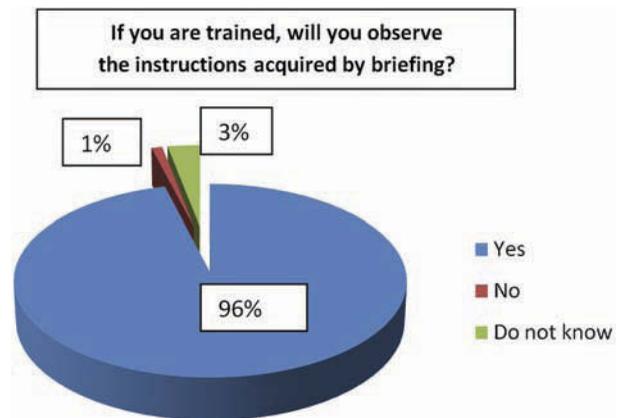
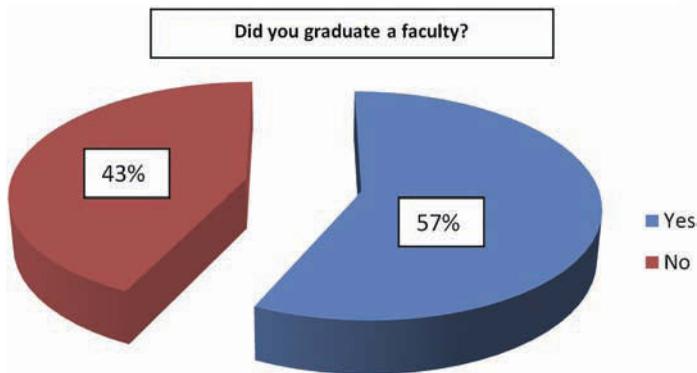
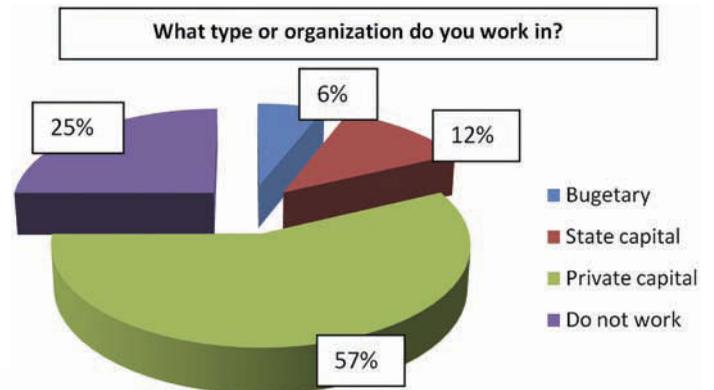
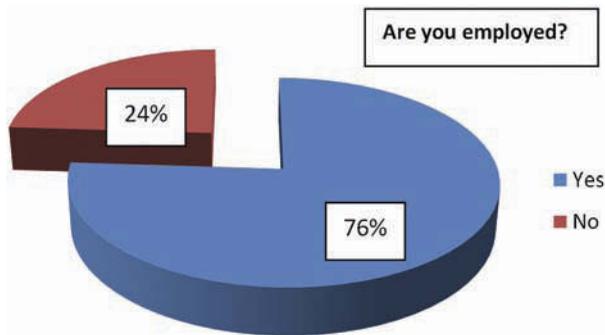


You are aged between



How do you get involved in case of accident caused by dangerous substances?





## Conclusions

The analysis of the inquiry results emphasized the followings:

1. 92% of the interviewed subjects stated that an accident caused by dangerous substances affects health, safety, assets or all elements, yet only 57 % of the population is aware of the fact it lives in an area which is exposed to pollution with dangerous substances.
2. 58% of the interviewed subjects declared that they have access to Internet, yet from the answer to question 7, it results that 67% accessed Internet within the last year.
3. 3% of the subjects answered that they do not know if, as a consequence of their briefing, they will apply the instructions, mainly because of the emotions in critical situations.
4. There were subjects who declared that they work (76%), yet in a proportion of

1 % their statement is not confirmed (correlation of answers for questions 14 and 15).

5. 65 % of the subjects access Internet at least once in six months.
6. 53% of the subjects aged under 45 years access Internet once a month, of which 49% graduated a faculty.
7. 20% of those under 25 years old access Internet everyday.

53% of the subjects declared that, if there were information on the web page, they would access them, yet, correlated with

the answers to the question if, as a result of their briefing, they would observe the received instructions, it results that only 49% of the subjects will observe the instructions. If we subtract the error of 13.85%, it results that 41% of the civilian population will observe the instructions. Considering that it represents a satisfactory percentage, the most indicated briefing method is the web page.

The research will be continued with another inquiry for determining the necessary information to be included within the web page.

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# PRINCIPLES FOR EFFECTIVE RISK GOVERNANCE AND CONTROL

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**Abstract**

*The paper presents the major organisational components of Enterprise risk management (ERM) that together aim to raise the level of risk management effectiveness across the organization. These organizational components cover: Risk management processes – including risk identification and prioritization, risk strategy, and governance and control, Elements of organizational structure, Tools, methodologies, and systems and Skills. Managing the risks effectively is not only a fiduciary duty of executives and boards, it has also become key to value creation. As a particular case, the paper presents Transelectrica – the Romanian Electricity Transport and System Operator that develops and implements an integrated program – Enterprise Risk Management Program, that effectively integrates the risks across the entire Company, allowing tailoring imaginative and cost-effective options for risk reduction and risk transfer, in order to minimize and control the critical risks and to determine the strategies on processing, maintaining, transferring, recovering and restoring the Company's assets with the view of their being protected.*

**Keywords:** risk management processes, risk identification, risk strategy, value creation, risk reduction, risk transfer

## Enterprise Risk Management Implementation Principles

In enterprise risk management (ERM), a risk is defined as a possible event or circumstance that can have negative influences on the Enterprise activity [1]. Risk Management lays the groundwork for decisions about allocating resources to manage risk and

reduces the element of surprise. Its impact can be on the very existence, the resources, the products and services, or the customers of the enterprise, as well as external impacts on society, markets, or the environment.

Enterprise risk management ERM consists of a set of organizational components covering: Risk management processes, Elements of organizational structure, Tools,



methodologies, and systems and Skills, that together aim to raise the level of risk management effectiveness across the organization. ERM allows the Companies to develop adequate strategies for estimating the total risk to which the company is exposed, evaluating risk control and risk-financing strategies, and for using risk analysis to help select the most effective strategies, protecting the company from losses that would have a serious impact on corporate wellbeing; ERM allows a more effectively resources allocation to various risks' avoidance, transfer, control or financing options, evaluating residual risks to be retained, in terms of type and magnitude, improving communication within an organization on vital risk and hazard control issues.

The Union of the Electricity Industry – EURELECTRIC is the sector association representing the common interests of the electricity industry at pan-European level,

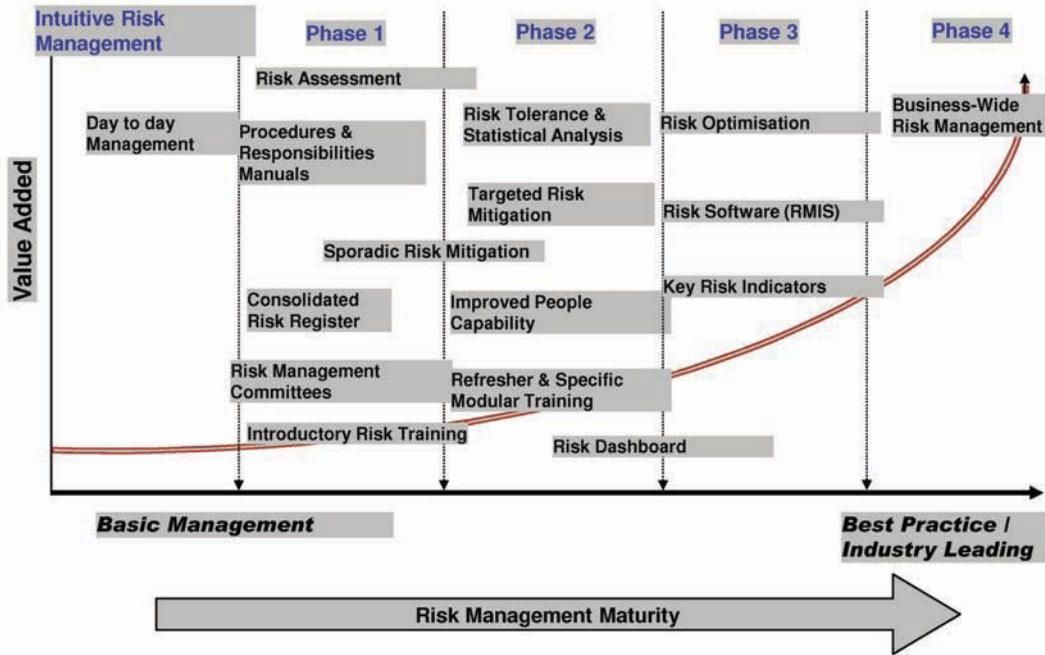
contributing to the competitiveness of the electricity industry and helping provide solutions to the challenges of sustainable development. EURELECTRIC's group on Risk Management has published a series of White Papers, designed to serve the needs of European electricity companies at various stages of implementing enterprise risk management and this paper is based on these reports [2], the author of present paper being participant in elaborating them. Implementing ERM components can be made easier by following three implementation principles: Incremental and iterative implementation, Integration, Focus on Value creation.

## **Incremental and iterative implementation**

The three processes of ERM (risk prioritization, risk strategy, risk execution / governance and control) reinforce one another. It is more effective to set up a full ERM process in the first year and incrementally improve over time, than to start with one of the steps and neglect the others in the first year. As ERM cannot be implemented in one go, it is important to carefully design an incremental implementation plan that builds on the efforts of the previous years and manages expectations of the rest of the organization [3].



## Improving Risk Management in Transelectrica



**Figure 1** – Iterative improving Risk Management in Transelectrica

There are two main options to structure an implementation plan:

- Process by process – setting up ERM one process at a time;
- Iterative – deploying all ERM processes in the first year in a draft fashion and gradually improving them over time from accumulated experience and by adding new capabilities. This second option is applied in Transelectrica, based on multi-annual road-map.

## Integration

The same overall approach should be deployed across all business units, markets, assets, and geographies with the same level of rigor, discipline, and effort invested in proportion to the importance of the risks [4].

One of the key contributions of ERM is to provide a company’s board and management team with an integrated perspective on risk. To achieve that goal, ERM should be deployed across all business units, markets, assets, and geographies with the same methodology, even if some operational or functional units claim that they need to make exceptions.

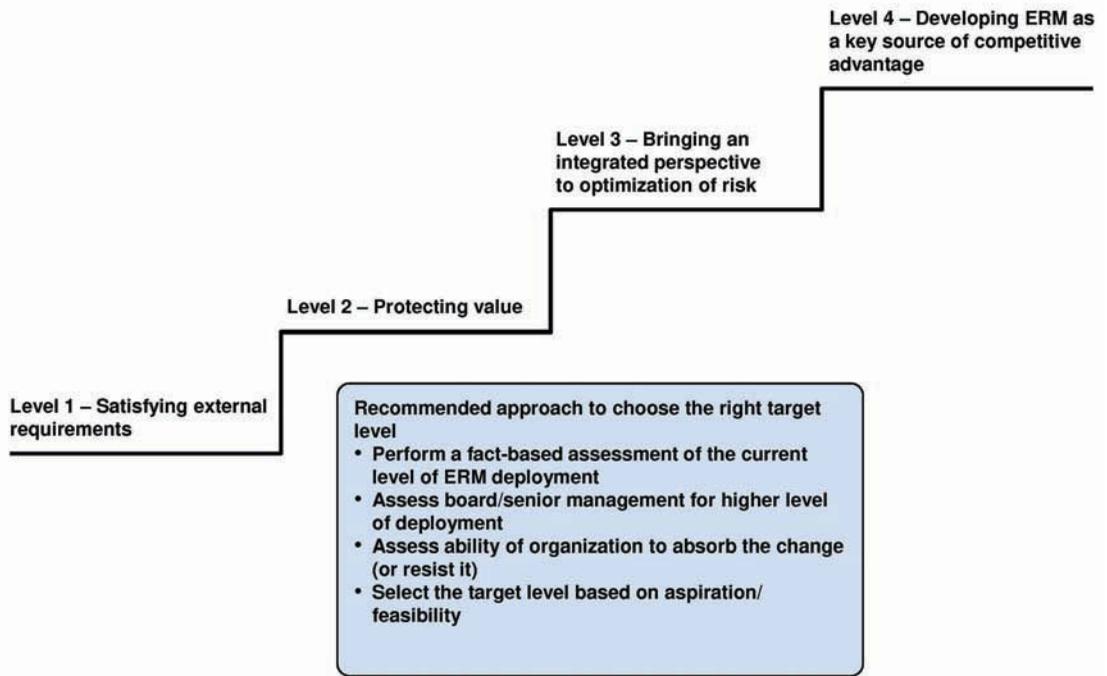
## Focus on Value creation

By equipping a company to apply effective tools and methodologies to quantify risks and define effective risk strategies, ERM contributes to the bottom line by improving risk/return ratios. For electrical utilities in Europe, compliance is an important consideration, but second in importance

to the necessity of managing the unprecedented increase of risks in the sector. As a consequence, ERM should be focused on developing organizational capabilities to manage risks more effectively, resulting in improved risk/return ratios and additional

risk-adjusted value for shareholders [5]. To succeed, we need to start by assessing the challenges they face and setting clear goals that are ambitious but still achievable given the starting point in their company.

### Choosing the right target level



**Figure 2 – Choosing the right target level**

Most utilities in Europe have already started on the path to enterprise risk management. We may consider four broad levels of ERM sophistication, each level bringing one or more new capabilities on top of the previous levels: satisfying external requirements, protecting value, bringing an integrated perspective to optimize the cost of risk, develop ERM as a key source of competitive advantage. Cases and examples contributed by

the companies that participated in CIGRE C1.16 Transmission Asset Risk Management Working Group demonstrate the use of a range of risk management techniques [6]; also, the development of international standards on risk management emphasizes the international trend that risk management is becoming a formalized process for informed decision making in business all over the world [7], [8].



## Balancing Quantitative and Qualitative Approaches

In the electricity sector, many high-priority risks are difficult to quantify because of a lack of readily available data on which to base robust statistics (e.g., regulatory risks). Moreover, even for areas where data is available, developing robust quantitative analyses is costly and typically requires an inordinate amount of effort to do properly for lower-priority risks. As a consequence, it is important to develop qualitative approaches able to provide reasonable answers when either robust data does not exist or the extra precision provided by quantitative analyses is not worth the investment. Here are some examples of the use

of more qualitative approaches, depending on the objective at hand:

- **Risk identification and prioritization** – large companies typically identify several hundred different types of risk and need to priorities them to focus managerial action. To establish priorities, detailed quantification is not needed. A scoring approach, based on a **calibrated** qualitative assessment, is sufficient for the purpose, provided the corporate risk management team provides a clear and explicit definition of the scores and checks the results for overall consistency. Such a qualitative approach provides better results in terms of risk prioritization with fewer resources than a systematic attempt to identify all risks.

## Risk Map and Controls Priority

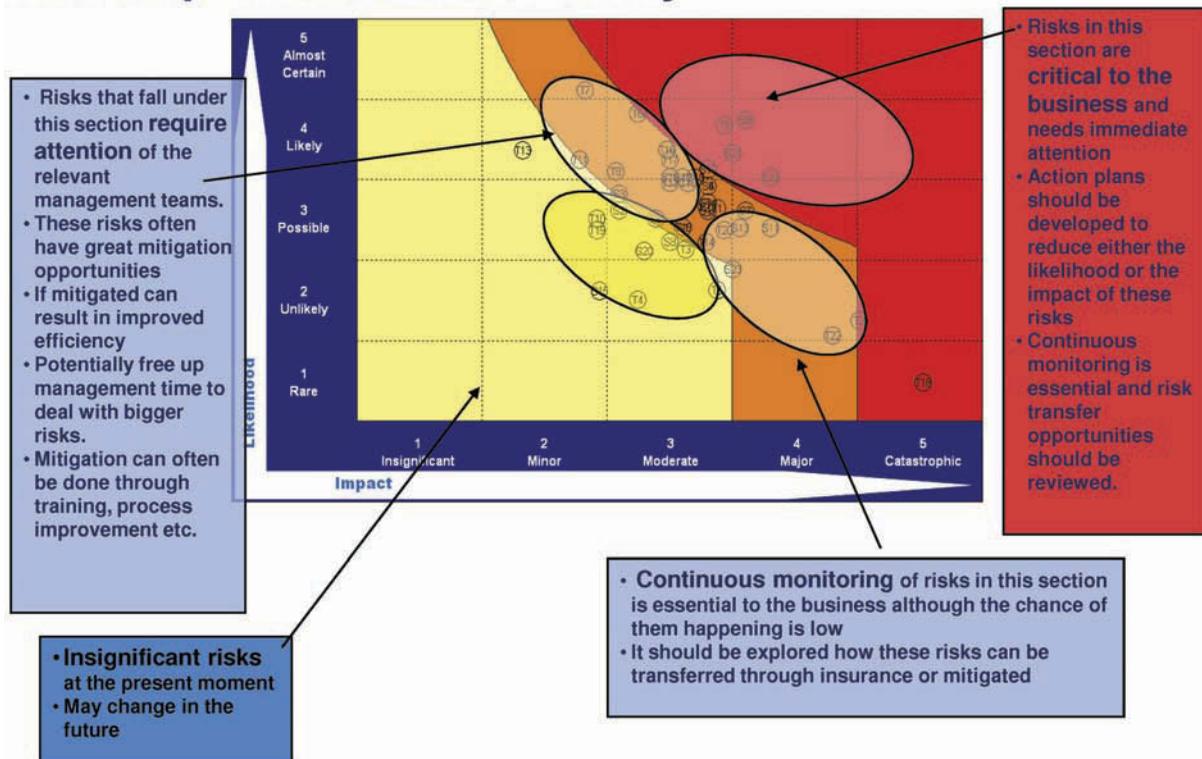
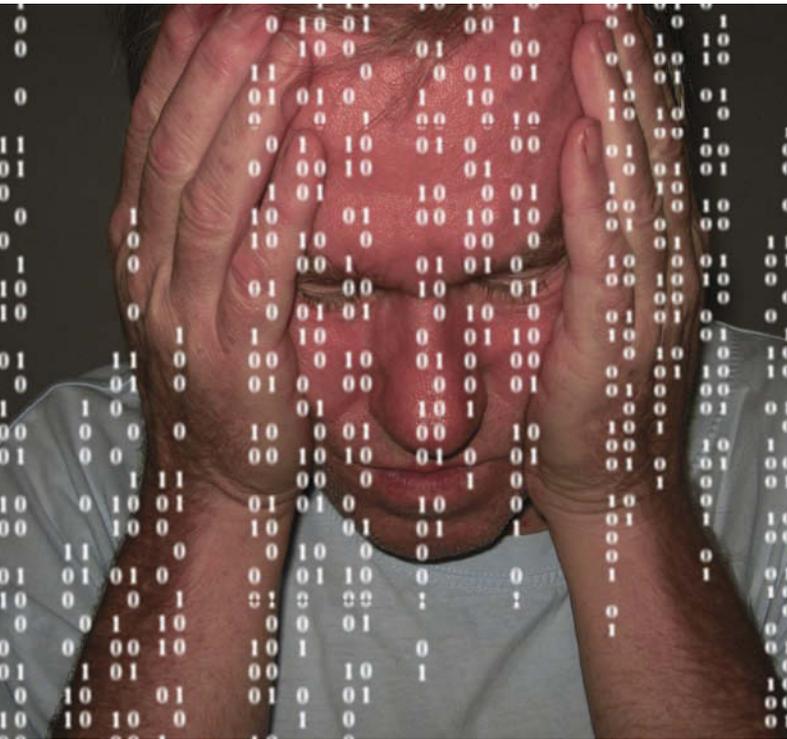


Figure 3 – Risk Mapping and Control Strategy



- **Risk strategy** – to define a risk strategy, quantitative modeling is helpful (e.g., to assess the impact on the company of individual decisions under discussion) but is only one input in the process.
- **Risk execution and control** – in the execution phase, different types of quantitative tools are used, e.g., to measure distance from risk limits and risk adjusted performance. However, qualitative tools also have a role to play.

In the electricity sector, many high-priority risks are difficult to be quantified due to lack of readily available data to base robust statistics (e.g., regulatory risks). Moreover, even for areas where data is available, developing robust quantitative analyses is costly and typically requires an inordinate amount of effort to do properly for lower-priority risks. As a consequence, it is important to develop qualitative approaches able to

provide reasonable answers when either robust data does not exist or the extra precision provided by quantitative analyses is not worth the investment.

Regarding risk identification and prioritization – we may identify many different types of risk and need to prioritize them to focus managerial action. A scoring approach, based on a calibrated qualitative assessment, is sufficient for the purpose, provided the corporate risk management team provides a clear and explicit definition of the scores and checks the results for overall consistency [9]. To define a risk strategy, quantitative modeling is helpful, e.g., to assess the impact on the company of individual decisions, but is only one input in the process.

## Establishing a Common Risk Culture

While tools and methodologies can contribute a great deal to setting up a common ground, more is needed to establish a common understanding of basic risk terminology, approaches, and concepts. We see three types of initiatives that can help to spread a common risk culture and open up the risk „silos” within an organization [10]:

- **Distributing a „risk management code”** – provided to executives and managers across the company, the code is a document that defines a common risk language and illustrates, using company-specific examples, the basic risk concepts.
- **Setting up a network of trained managers** – in-depth training of a number of managers and executives in basic risk concepts, and putting them in charge of

providing on-the-job training in basic risk concepts helps the new risk culture to put down roots and spread.

- **Establishing a rotational program** – while corporate risk management needs to keep a certain amount of staff stability to build and maintain distinctive technical capabilities, it is also important for these skills to infuse the entire business. One approach is to rotate promising young executives from business units or other corporate functions to corporate risk management for extended periods of time, in order to build up a network of „black belts” that will be able to lead the implementation of ERM at a superior level.

## Transelectrica Risk Management System Implementation

Transelectrica SA, the Romanian Transport and System Operator, is developing a continuous process of a systematic and comprehensive to identify the critical risks and to quantify their impact, with the view of implementing an integrated program, to minimize and control the risks and to set the appropriate strategies on treating, preserving, transferring and recovery procedures meant to protect the values of the company.

### ERM in Transelectrica – a continuous process

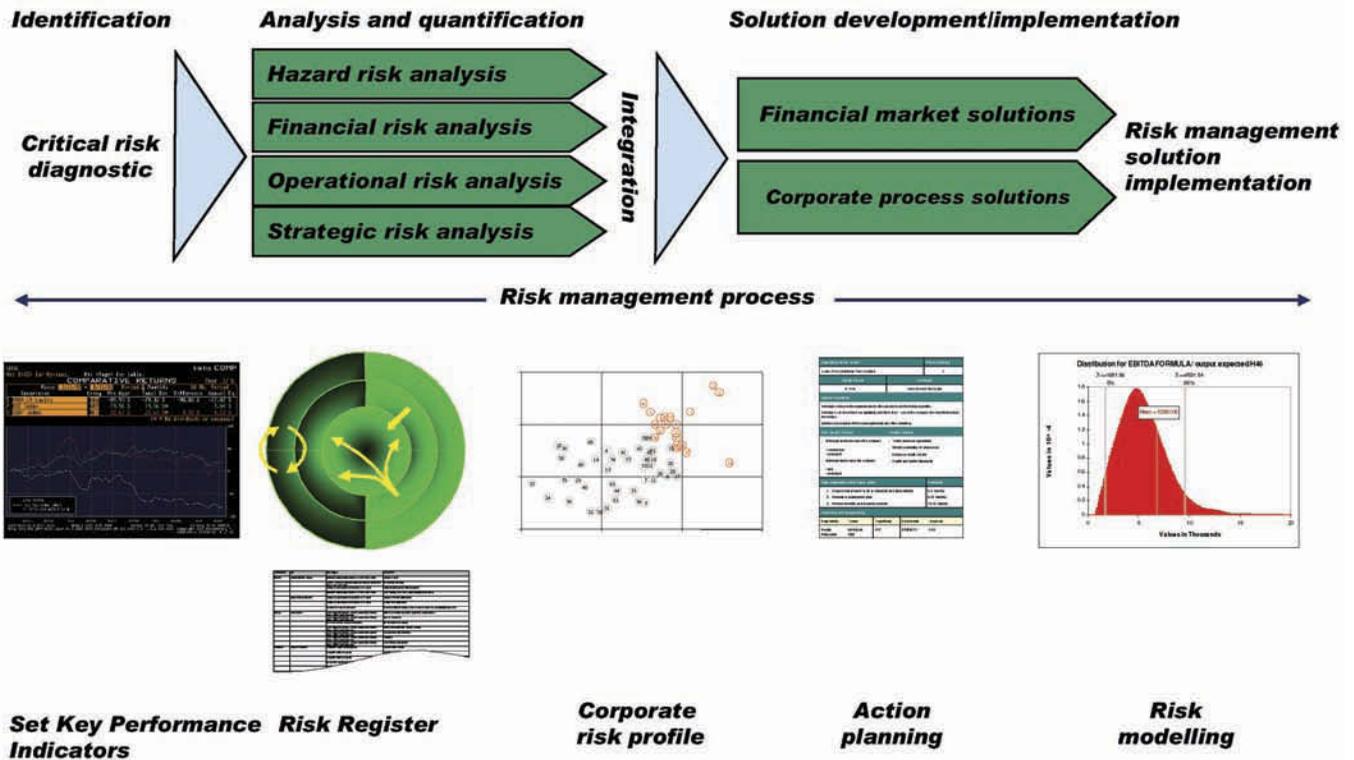


**Figure 4** – Risk Management in Transelectrica – a continuous process

With the consultants Marsh [11] and AON [12], many stages have been developed jointly, starting in 2002; the main risks are identified, analyzed and assessed, being proposed process solutions/implementing strategies on risk management within the Company, to

address the following objectives: anticipate and prevent major disruptions in operation, ensure adequate liquidity/ cash flow for operating expenses, debt payments and strategic investments, protect long-term viability and strength of the Company.

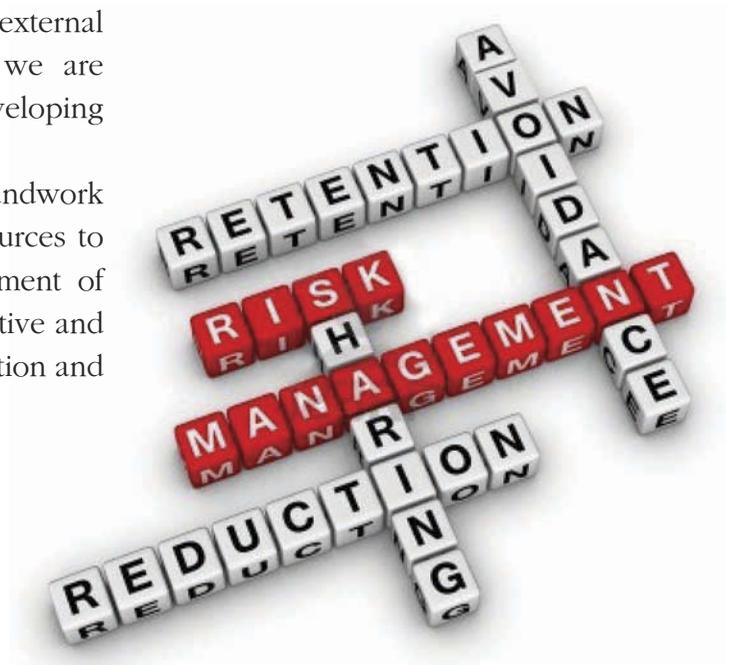
# Enterprise Risk Management Program



**Figure 5** – Enterprise Risk Management Program in Transelectrica [11]

Once the level of satisfying external requirements has been fulfilled, we are focusing on protecting value, developing the Business Continuity Plan.

Risk Management lays the groundwork for decisions about allocating resources to manage risk and reduces the element of surprise, allowing tailoring imaginative and cost-effective options for risk reduction and risk transfer.



# Risk management process

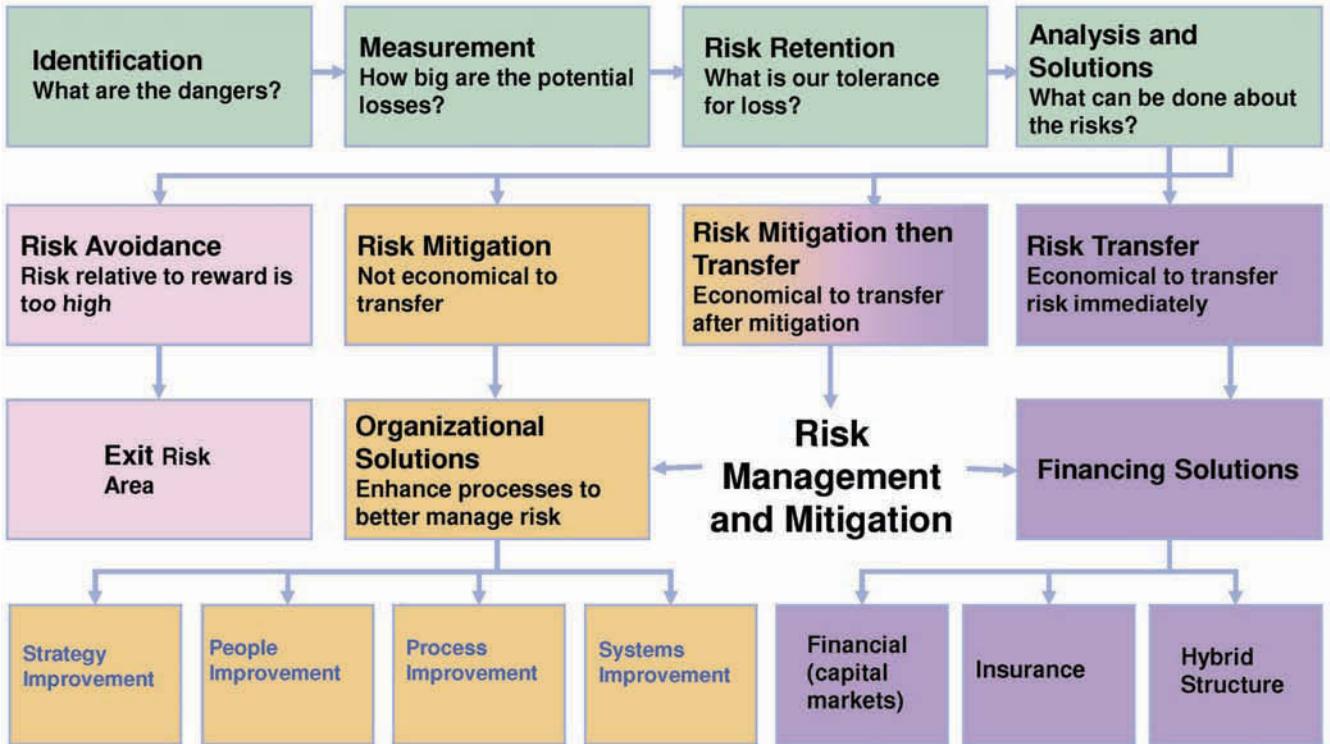


Figure 6 – Risk Management Process

## Conclusions

ERM outputs are pivotal factors in corporate strategic planning and budgeting decisions; as companies augment the sophistication on the ERM programs, the benefits derived from increase.

Being the Romanian Transmission and System Operator, Transelectrica, as providers of a public service in which the guarantee and quality of electricity supply is a fundamental element of the activity, have always paid special attention to managing risks in the businesses through various risk control and mitigation mechanisms, especially

associated to the guarantee of electricity supply continuity.

A successful implementation of complete risk management system would only be achieved by means of adequate co-ordination, fully embedded within well design organizational built-up. It will permit the Company to make both short and long range plans to reduce, eliminate or assume the risks; the Company can better develop contingency plans and improve hazard control programs. It provides also other senior executives with information to develop strategies for estimating the total risk to which the company is exposed, evaluating risk control and risk-financing strategies and for

using risk analysis to help select the most effective strategies.

ERM outputs are pivotal factors in corporate strategic planning and budgeting decisions; as companies augment the sophistication on the ERM programs, the benefits derived from increase. Utilities face a large number of risks, some are persistent, and some may come and go. The

landscape of risks a utility faces is far from static; its components and their relative importance are in perpetual flux. Managing the risks effectively is not only a fiduciary duty of executives and boards, it has also become keys to value creation and risk strategy is what drives effective risk management.

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# RISK MANAGEMENT OF NUCLEAR POWER PLANTS

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Abstract

*In today's global energy environment, nuclear power plant (NPP) managers need to consider many dimensions of risk in addition to nuclear safety-related risk. Nuclear power plants are considered critical infrastructures by most countries. As a consequence there are a lot of efforts spent for identifying and implementing the appropriate measures to eliminate or reduce as much as possible the risk impact involved in their operations. In order to stay competitive in modern energy markets, NPP managers must integrate management of production, safety-related, and economic risks in an effective way. This paper presents the steps of the risk management process: identifying risks (list, measure, and rank); identifying techniques/strategies to manage the risk (reduction, retention, and transfer the risk); implementing risk management strategies; and monitoring the effects of implemented actions.*

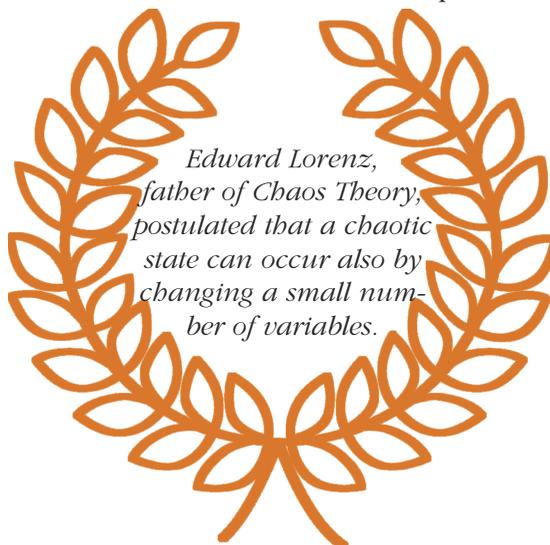
**Keywords:** critical infrastructure, risk management, nuclear power plant, strategy

## INTRODUCTION

Critical infrastructures are physical or virtual systems and assets so vital to the nation that their incapacity or destruction would have a debilitating impact on national and economic security, public health, and safety. These systems and assets – such as the electric power grid, chemical plants, nuclear facilities, water treatment facilities, dams, transportation systems (Fig. 1) –

are essential to the operations of the economy and the government. Recent terrorist attacks and threats have underscored the need to protect our nation's critical infrastructures. If vulnerabilities in these infrastructures are exploited, our nation's critical infrastructures could be disrupted or disabled, possibly causing loss of life, physical damage, and economic losses.

In today's global energy environment, nuclear power plant (NPP) managers need



to consider many dimensions of risk in addition to nuclear safety-related risk. Nuclear power plants are considered critical infrastructures by most countries. As a consequence there are a lot of efforts spent for identifying and implementing the appropriate measures to eliminate or reduce as much as possible the risk impact involved in their operations. In order to stay competitive in modern energy markets, NPP managers must integrate management of production, safety-related, and economic risks in an effective way.

This integrated risk management (RM) approach generates benefits that include the following:

- **Clearer criteria** for decision making.

- **Making effective use of investments** already made in probabilistic safety analysis (PSA) programs by applying these analyses to other areas and contexts.
- **Cost consciousness and innovation** in achieving nuclear safety and production goals.
- **Communication improvement** – more effective internal communication among all levels of the NPP operating organization, and clearer communication between the organization and its stakeholders.
- **Focus on safety** – ensuring an integrated focus on safety, production, and economics during times of change in the energy environment.



**Figure 1** – *Examples of Critical Infrastructures (clockwise from upper left: chemical plants, nuclear power plants, railroads and hydroelectric dams)*

## DEFINITION AND TYPES OF RISK

In general, risk encompasses two aspects: the potential for things to change, and the magnitude of the consequences if they do change. The notion of risk includes both opportunities and threats. Different disciplines – economics, engineering, safety analysis – will have their own more specific definitions of risk, each reflecting a different disciplinary focus on parameters and consequences, but all will in some way encompass the frequency and consequences elements of risk.

### Consider the following case:

A plant manager is considering replacement of the plant's instrumentation and control system as a prelude to plant life extension. The replacement has not (yet) been required by the nuclear safety regulatory body. The manager must weigh the risk of making this investment. Management's advisors may have the following views:

- For the nuclear safety analyst, the relevant risk is the potential for ending up with a system that can demonstrate a frequency of radioactive release that satisfies established institutional and regulatory goals (*a focus on nuclear safety related risk*).
- For the financial analyst, the relevant risk is the potential that the cost of the investment will not be recovered over the life of the investment (*a focus on financial risk*).
- For plant operation, the relevant risk is that the installation and operation of the new system may introduce operational difficulties (or operational benefits) (*a focus on operational risk*).

- For the project manager, the relevant risk is the probability that the project will be completed on schedule and within budget along with the associated cost impacts (*a focus on budget and schedule risks*).

All of these views encompass aspects of risk that are important to the organization. Organizations are exposed to many sources of risk, which might be characterized into four broad categories:

1. safety related,
2. production/operations,
3. commercial/financial, and
4. strategic.

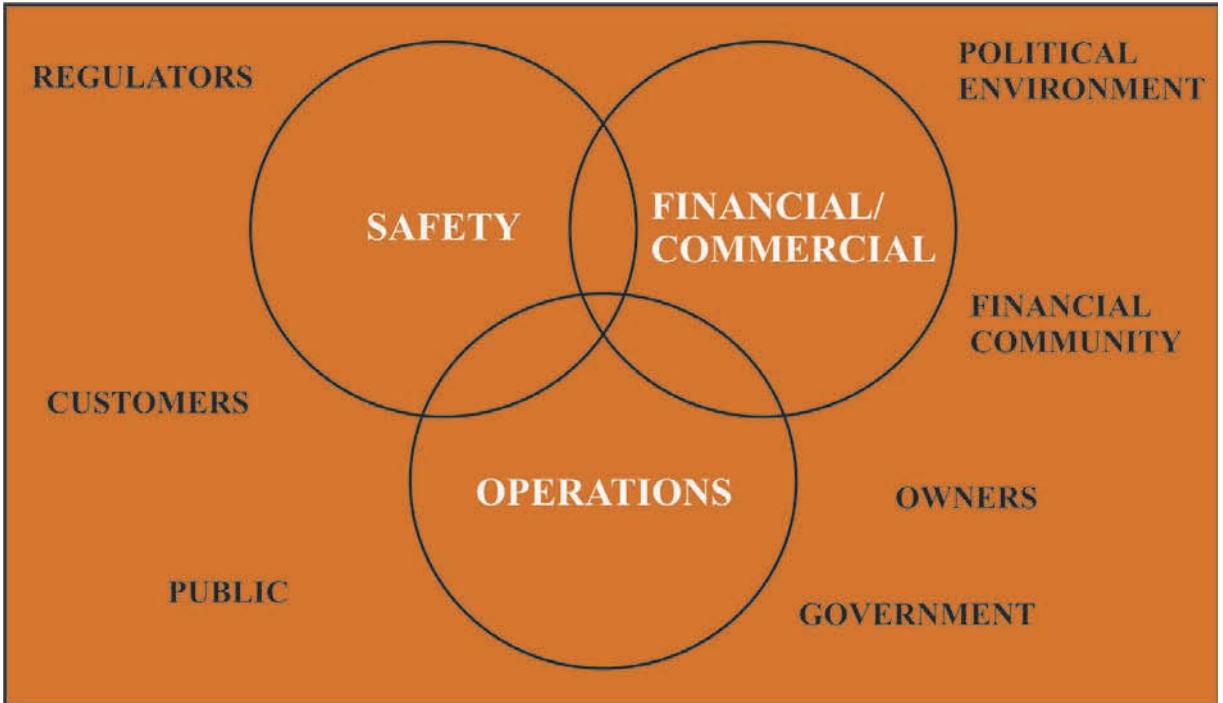
## RISK MANAGEMENT STEPS OF THE CRITICAL INFRASTRUCTURES

The NPP operating organization is viewed in this paper as comprising three major sectors (safety, production/operations, and financial/commercial) embedded within the



strategic environment (Fig. 2). These sectors intersect one another, so that decisions in one arena have impact and are impacted by decisions in a different sector. In addition,

there are stakeholders outside of the NPP who have impact on these three sectors as well as on the strategic environment.



**Figure 2** – Risk management environment model for a nuclear power plant operator  
 [Source: Risk management: A tool for improving nuclear power plant performance, IAEA, 2001]

**STEP 1.**  
**Identification, measurement**  
**and assessment of risk**

In the management of a nuclear power plant, risk can come from many sources – production processes, training processes, social responsibility (including communication with the public), outside influences (natural disasters and economic factors), and financial processes, to name a few. Many different sources of information can be used to identify sources of risk, such as industry (or company) specific or generic

risk exposure checklists, flowcharts of critical processes, examination of contracts, physical inspection, analysis of financial statements, and employee, contractor, or regulator interviews. A wide-reaching integrated information system needs to be used to provide continual updates about operations, acquisition of assets, and changing relationships with outside entities and stakeholders.

After identifying sources of risk, one needs to characterize the risk. Deterministic and probabilistic safety analyses have been used extensively in nuclear power plants around the world for assessment of nuclear

safety risk. These techniques can be expanded, however, to measure and assess the risk of non-nuclear events, such as protecting plant investment, maintaining plant availability, and analysis of re-licensing issues.

Some qualitative questions can help the NPP manager examine the essential characteristics of the risk from a conceptual point of view:

- Does the risk produce opportunities and threats, or only one? If both, do we need to measure both?
- Is the cause of risk likely to be a continuously occurring or is it episodic or rare in time and space?
- Is the risk such that a risk management decision/action will be reversible in the future or is it likely that for this source of risk, the choices are basically irreversible?
- What are the potential effects of the risk on the performance of the NPP owner or operator?
- Is the source of risk such that it is mission critical, 'make-or-break', or is it a source of risk that will modify results in less severe ways?

## STEP 2.

### Determination of appropriate risk management techniques

Risks identified and characterized are next evaluated with respect to the best combination of techniques for management. Three generic categories of risk management techniques include *reduction of risk*, *retention of risk*, and *transfer of risk*. In practice one or more of these techniques is likely to be used in managing risks associated with a particular issue. It is also important to examine whether the use of a particular solution takes account of interaction amongst different areas of risk. For example, in the implementation of a design change to improve nuclear safety the manager needs to examine if the change would have unacceptable industrial safety consequences.

#### Reduction of risk

Reduction of risk involves at least two dimensions. First, to reduce the likelihood (or frequency) that an event occurs and second to reduce the consequences of an event, if it does occur. Techniques to reduce



frequency of occurrence include, for example, engineering measures, education of employees, and enforcement of standards. Reduction of severity can include measures to keep events from progressing into more severe episodes, as well as measures to reduce the economic impact of severe disruptions. These risk reduction measures may be pre-event, simultaneous-with-event, and/or post-event actions. Another dimension of understanding reduction/control tools is to characterize them according to whether they focus attention on the behavior of the individuals involved, on the functioning of the physical assets (machinery, control systems, etc.), or the environment within which the event would occur.

**Example of reduction of risk:**  
*remote diagnostics, smart instruments*

Smart instruments facilitate remote diagnostic capabilities that allow operators, plant management, or outside experts to monitor the condition of key equipment, for example, identifying possible valve failures, pinpointing faulty meter readings, checking valve seat pressures, reporting process abnormalities, etc. Not only will the remote diagnostics be able to identify which valves need overhauling, for example, but that information can then be integrated with the plant preventive maintenance program to optimize the use of personnel and resources. Schimmoller gives examples of companies using remote diagnostics, different applications for such systems, and cost/benefit analysis data.

**Transfer of risk**

Risk transfer means that the original party exposed to a loss is able to obtain a substitute party to bear the risk. These transfers occur by contract, through use of financial market instruments, or by terms and conditions of sale and delivery of products and services. In some cases, the degree of risk is reduced through a transfer if the risk-accepting party has portfolio effects (such as for insurance contracts where a pooling of risk takes place); in other cases, degree of risk stays the same but is transferred to another party willing to accept the variation of performance, for a given price.

Most risk transfer mechanisms are some form of contractual agreement with a counter party. In contracting, the idea is to put the risk to the party who can control the



results, or prevent the problem, or manage the risk if it happens, or can best absorb the impact.

### Retention of risk

The third risk management technique, retention of risk, is, perhaps, the most difficult concept to understand for managers in the NPP industry. Because of the almost one-minded concept of risk as meaning nuclear safety risk, and the perception that nuclear safety-related risk must be managed to negligible levels, it is harder for managers on the nuclear side of these organizations to consider the idea of deliberately accepting measurable levels of other types of risk, than perhaps in any other industry. Think of the situation of someone starting a business. All risk ‘resides’ in the

owner’s pockets. As the business evolves, the owner identifies sources of risk that can be reduced or transferred to others, but a degree of risk inevitably remains. Some factors that cause this risk may be understood by the owner and accepted as being reasonable tradeoffs for the possibilities of high returns. In fact, this ‘accepted’ or retained risk is the real reason that owners are involved in the business in the first place. The retained risk produces the possibility of high returns for the investment made. Only if financial risk is present, is there any possibility of high returns.

### STEP 3. Implementation

Step 3 is to implement the chosen techniques or strategies.

Before implementing the chosen strategies some final checks are suggested:

- Does the strategy or solution address the identified risks?
- Is the selected solution consistent with the solutions to other risks?
- Are the key risks addressed by the selected strategy?
- Can the exit strategy be exercised?
- Is flexibility maintained?

The key aspects of implementation are to assign responsibilities and accountabilities. It is helpful to establish milestones and checkpoints to allow verification that responsibilities and accountabilities are being met. Measures or indicators of success should also be established to track the success of the strategies.





#### **STEP 4.**

### **Monitoring and feedback**

The risk management process is iterative. In many cases the feedback mechanisms are automatically built into the tool, while in other cases, a more formal feedback analysis, outside of the tool, is necessary.

One purpose of monitoring and feedback mechanisms is to help the utility recognize if (or when) an exit strategy needs to be invoked. Recalling the generic questions about the nature of risk, one of the issues for characterizing a source of risk is the extent to which a management tool can be backed out of; i.e., whether the risk management strategy can be reversed or if it is a permanent choice. When an exit strategy is possible, the monitoring and feedback loop will be continually reevaluating the data to

determine if the risk management should continue or if the situation should be terminated.

Another aspect of the monitor and feedback process is explicit recognition of where the responsibility lies for overseeing the risk management program. Use of diagnostic information and reporting systems, coupled with regular in-house risk management meetings and periodic reviews by outside experts will help ensure that company risk management policies are followed in general, in addition to the more specific actions relating to particular plant systems. These should be in addition to the analysis and reporting requirements of regulatory authorities to which the management must answer.

### **Conclusions**

As was indicated at the beginning of this paper, in today's global energy environment, NPP managers need to consider many dimensions of risk in addition to nuclear safety-related risk. In this context, the following are considered to be the most important messages in this paper: the benefits/value of integrated risk management have been demonstrated; it is necessary for NPP managers to main a broad perspective in integrated management of safety-related, operational, commercial/financial and strategic risks; risk management should be integrated into an organization's management



systems, not be a stand along process; a framework for conducting risk management has been provided along with examples illustrating use of the framework; a broad range of examples have been provided of

an integrated application of risk management; where existing PSA tools/results related to nuclear safety-related risks have been used to help manage other risk areas.

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# DECREASE OF THE NUMBER OF RISK DRIVERS IN THE SUPPLY CHAIN

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Abstract

Today, meeting customer requirements is a key factor for organization's survival. Supply-chain management not only considers delivering the end product to the customer as an effective factor, but believes that a set of hierarchical suppliers should be engaged in order to integrate involving organizations and coordinate all materials, information and cash flows. These processes are complicated, so that managers deal with many challenges in decision making of Supply chain. In this paper, these challenges are categorized into three levels; then Balanced Scorecard is introduced as an approach to integrate visible and intangible assets for organization's financial growth and Performance measurement, SCOR model is a tool assisting BSC in translating strategic objectives into operations and ultimately; FMEA is introduced as a tool for helping managers in selecting the safest approach with minimum risk.

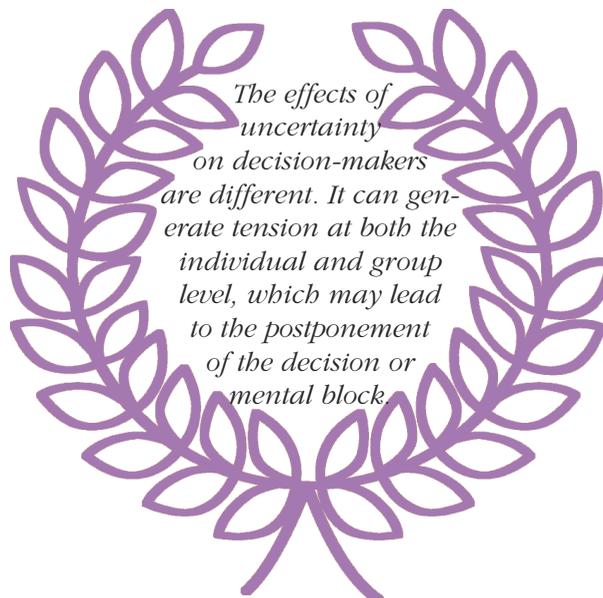
**Keywords:** Supply-chain management, Balanced Scorecard, Strategy map, SCOR, FMEA

## INTRODUCTION

Nowadays, many companies begin to realize, on the way of optimizing logistic costs, that it is not enough to focus only on the organization itself; rather it is compulsory to include the members standing outside the organization, but in relationship with it in terms of physical and infor-

mation flows, such as suppliers, sub tiers, and distribution network. The challenge for

logistics managers became to integrate logistical performance across all operational facets of a business. This holistic concept has become known as Supply Chain Management (SCM). The Council of Logistics Management defines SCM as follows: „Supply Chain Management is the systematic,



strategic coordination of the traditional business functions and the tactics across these functions within a particular company and across business with the supply chain for the purpose of improving the long-term performance of the individual companies and supply chain as a whole.” Supply chain management is the integration of key business processes from the end user through original suppliers that provides products, services, and information that add value for customers and other stakeholder.

With today’s global trade, raising oil prices, maintaining best of the breed, supply chain management is extremely important to keep growing the top-line revenues while finding lower cost sourcing opportunities on a global scale. Evolution of technology and the technology-based businesses are becoming easily accessible for businesses to efficiently manage their process metrics in supply chain, and track their key performance indicators that keep tabs on the bottom line.

Supply chain managers usually deal with some challenges in determining organizational strategic objectives, and in translating

them into operational actions in order to meet supply chain’s requirements. These challenges could be divided into three parts as shown below:

- A) Lack of a balanced approach to integrate financial and non-financial measures;
- B) Lack of an appropriate tool for linking strategic objectives to operations;
- C) Lack of a comprehensive framework for decreasing risks of decision making.

The objective of this paper is to interpret and analyze these shortages and present an approach to overcome these problems so that managers could properly assess and manage the processes and direct organization to better decision making and higher value.

### **Lack of a balanced approach to integrate financial and non-financial measures**

While companies have transformed their supply chain to integrated supply chain, they have been in need of a tool which will show the combined performance of a supply chain, the end outcome of the efforts of all integrated members, new improvement areas through the supply chain, and whether the supply chain is improved or not. This needed tool is a supply-chain performance measurement system.

Today managers are aware of the significance of supply-chain performance measurement so that an integrated



measurement system for process assessment and good decision making is strongly needed.

BSC is one of the performance measurement tools in supply-chain management that can help managers in measuring supply chain processes, identifying shortages and in improving them. In today's turbulent and competitive market, there are so many factors impressing financial achievements of the organizations. In order to stay in competitive marketplace and challenge with other competitors, the organizations must consider and preserve so many factors simultaneously. Previously, managers' belief was based on the fact that in order to gain financial achievement, they must only consider financial measures and indicators (ROD); thus non-financial measures in traditional accounting were considered as costs. However, current competitive market clarified that not only to compete against other firms but also to stay in this environment, they strongly need to consider other measures as well. Today, non-financial factors like customers satisfaction, research and development, personnel education and so many other things called as knowledge-work are critical elements for each organization. BSC model observes these elements in three levels (perspectives), plus financial perspective [1].

Balanced scorecard (BSC) is developed by Kaplan and Norton (1996). This model was motivated by a belief that existing performance measurement approaches, were becoming obsolete. As Kaplan

and Norton mentioned, financial and non-financial measures must be a part of an information system for employees from all levels of organization. The BSC complements financial and non-financial measures of past performance with measures of the drivers of future performance [2].

Today Organizations insisting on using traditional methods, especially in financial aspects face big problems. The pressure for short-term financial performance can make firms reduce spending on new-product development, process improvements, human resources development, information technology and customer and market development. BSC provides a framework that translates company's vision and strategy into a coherent set of measures organized into four perspectives.

- 1) Financial Perspective where financial results are considered.
- 2) The Customer Perspective to identify the goals in order to satisfy customer's needs, and the measures useful for their monitoring.
- 3) The Internal Business Process Perspective useful to identify and monitor key processes, indispensable to achieve the previous perspective goals.

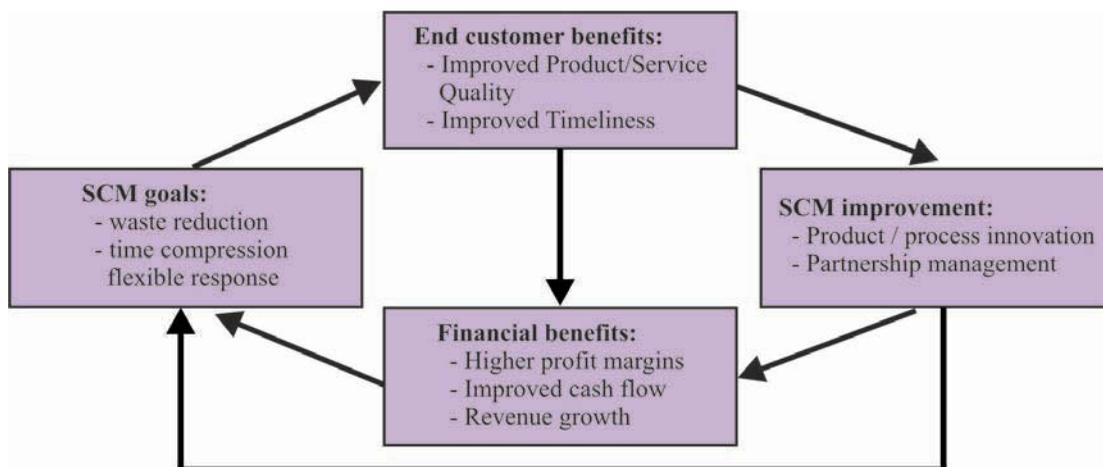


4) The Learning And Growth Perspective where goals and measures regarding innovation and learning are stated.

BSC assists organizations to realize that financial measures are not solely as important factors to achieve financial success, whereas non-financial measures and indicators should be considered as very significant factors for organizations as well, to create and deploy intellectual capital (or as some call it knowledge work), in order to increase value and asset to the organization. By using of BSC in supply chain, managers are capable of organize their invisible assets and accordingly increase financial values. Moreover, by using BSC, strategic objectives will be defined and determined, and some tools in BSC like a strategy map

indicate relationships between these objectives. The Balanced Scorecard (BSC) (Kaplan and Norton 1992, 1993, 1996, 2000, 2001 a, b) is not only a performance measurement system, but also a strategy management tool.

In following, besides describing strategic objectives of SCM in the format of BSC some measures are introduced for each objective. The most interesting aspect in the application of the Balanced Scorecard to the supply chain is the fact that it perfectly reflects the criteria, which, in some scholars' opinion, should characterize supply chain measures: linked to strategic goals, balanced, compared to specific targets, oriented to continuous improvement. Brewer and Speh identify a framework to monitor supply chain performance that has much affinity with the BSC (see Figure 1).



**Figure 1** – *The supply-chain management framework of Brewer and Speh*

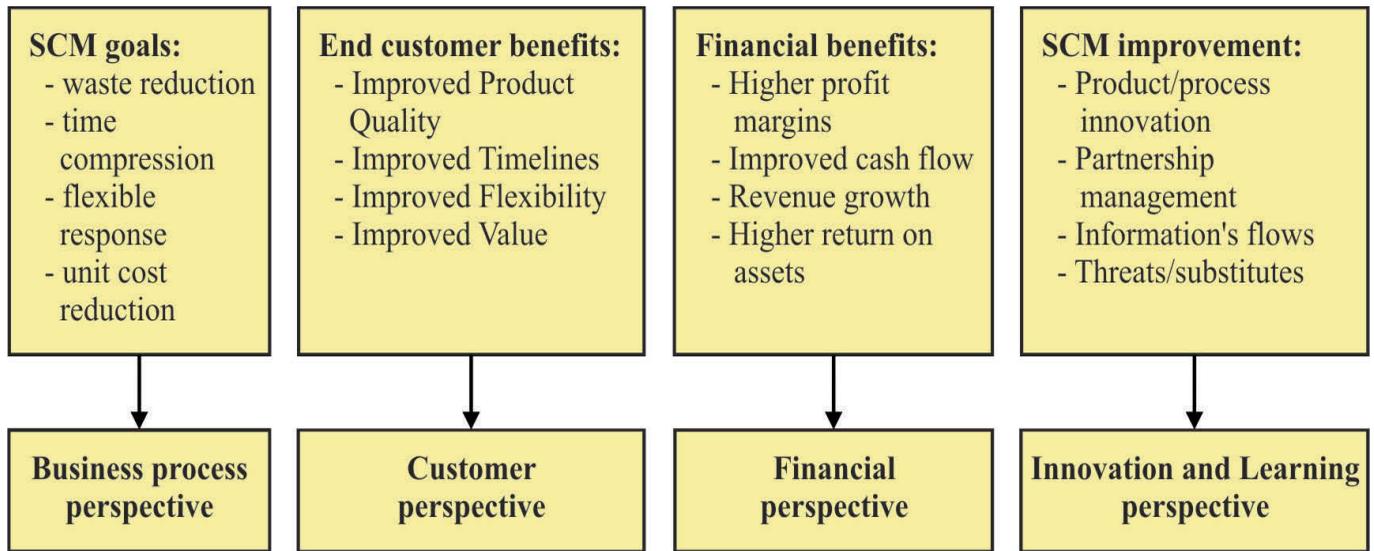
Supply-chain management performance should be evaluated in relation to:

- Supply-chain management goals (waste reduction, time compression, flexible response, unit cost reduction);
- The benefits for the consumer (product quality, delivery time...);
- The financial benefits for supply chain

operators, deriving on one hand from cost reduction and on the other hand, from the increase in revenues;

- The capability to improve performance, as learning and innovation abilities, continuously, is the basis of the maintenance and the improvement of supply-chain performance.

Figure 2 shows the affinities between the framework of Brewer and Speh and the BSC model:



**Figure 2** – *The relationship between the supply-chain management framework of Brewer and Speh and the Balanced Scorecard*

Through the BSC, supply-chain management goals can be measured by business process perspective, while customer perspective and the financial perspective indicators can measure its results (concerning customer satisfaction and financial results). Moreover, the innovation and learning perspective points out the supply chain's ability to improve along with its chance to survive in the long term. Brewer and Speh suggest specific measures that can be useful to monitor supply-chain performance in relation to each BSC perspective (see Figure 3).

These measures are merely indicative and can be integrated or replaced by more appropriate ones, depending on the circumstances: the authors stress that the list of measures is only a contribution to the

fresh debate about the most suitable measures to monitor supply chain performance. As regards to the application to the firm, the implementation of the BSC in the supply chain requires the adoption of a different philosophy and, in particular, the internal business perspective should be extended to have an inter-functional and inter-firm vision of performance.

Furthermore, in a supply-chain framework, the Balanced Scorecard should include both the measures concerning the whole chain, and those measures relating to the single members. In addition, connections between these two sets of measures should be established to monitor the contribution to the performance of each operator and to identify where possible problems in the chain are placed.

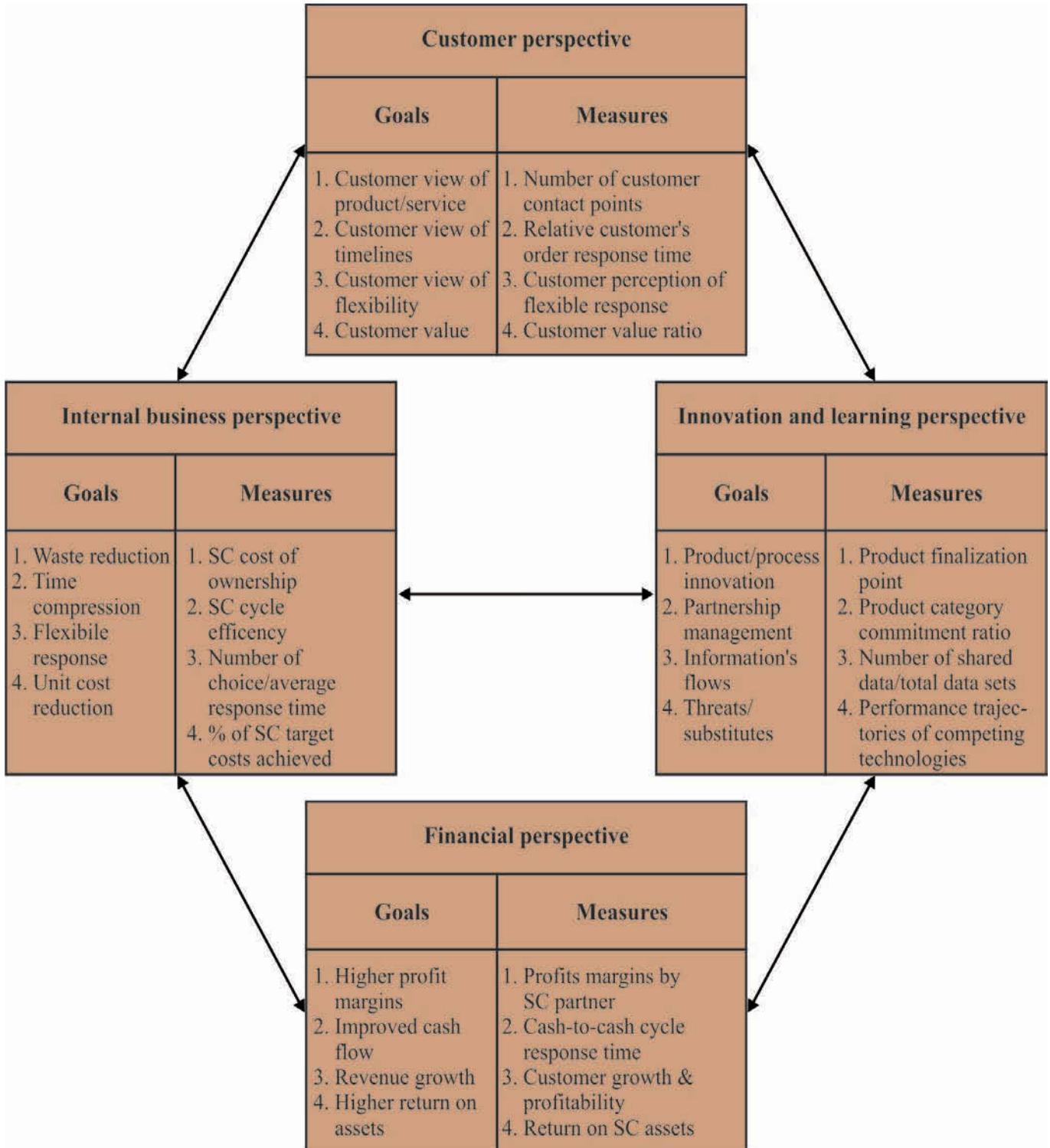


Figure 3 – A framework for the supply-chain Balanced Scorecard

## Lack of an appropriate tool for linking strategic objectives to operations

BSC helps managers to find performance drivers clearly, to explore and describe the strategy implementation map precisely, to execute strategy effectively and finally to learn from this circular process.

Strategy map concept originates from BSC and helps strategic objectives to be structured logically as it shows cause and affect linkages between these goals. For instance, a typical strategy map is shown in Figure 4 (Kaplan and Norton 2000). It gives a typical example of how the BSC links strategic objectives from different perspectives together:

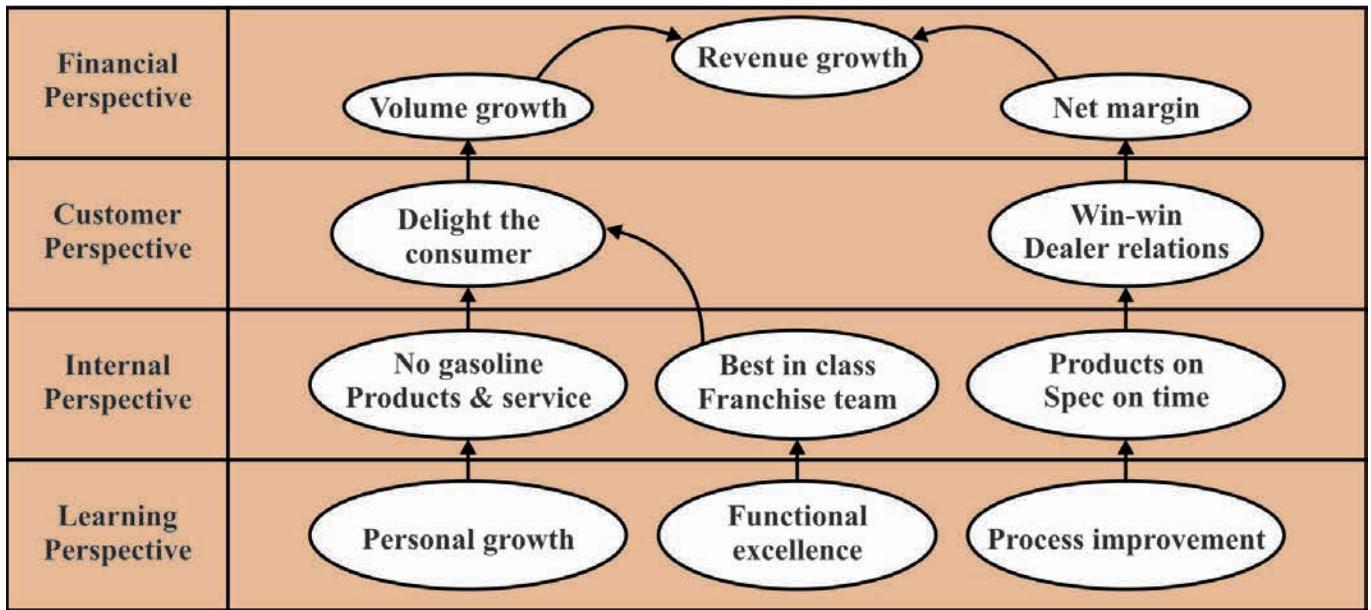


Figure 4 – Revenue Growth

The process of translating strategic objectives into actions is a difficult task. This difficulty is due to the wide range of possibilities and the lack of structured information. In addition, so far supply-chain managers are not successful enough to translate strategies into actions and operational measures. Managers have mostly focused on determining and setting of strategies. However little is obtained in identification and evaluation of these operations and in linking objectives to alternative actions.

This problem originates from this fact that there is a gap between strategies and

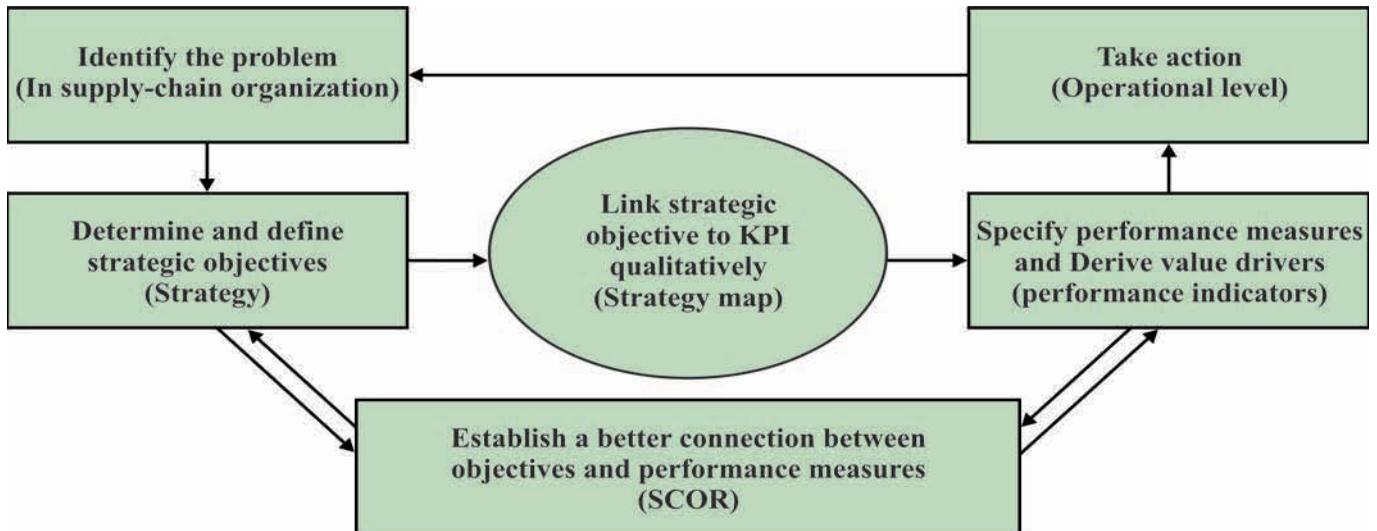
supply chain operations. To overcome this conflict the SCOR model is used. This model helps the organization to link strategic objectives to operations more appropriately and to some extent, bridge this gap.

The SCOR model determines a framework and set of indicators that could be used as a starting point for creating metric network and decomposition of strategic objectives [3].

This model is trying to describe business activities, operations and tasks corresponding to all levels that fulfill internal and external customer's needs.

The SCOR model specifies a set of metrics that could be utilized in processes' evaluation at each level of process hierarchy. The performance attributes and metrics are measured in five different categories, namely supply chain reliability, supply-chain responsiveness,

supply-chain flexibility, supply-chain costs, and supply-chain asset management. Each SCOR metric is associated with certain SCOR processes [4]. Four decision-making processes in order to link strategic objectives to operations are indicated in Figure 5:



**Figure 5** – *Link strategic objectives to operations*

As it is shown in Figure 5, the SCOR model is used to make a more effective linkage between strategic objectives and operations, and remove the conflict between the top-down strategy decomposition and the bottom-up implementation process more realistically.

At this stage, a question arises: is it possible to indicate all the involving factors and their relationship in unique framework? In other words, could supply-chain managers possess a tool to describe the vision, strategic objectives, performance measures, operations and the supply-chain levels stated in the SCOR model simultaneously?

The organization determines its vision and strategy (the strategy map enables to decompose objectives) and accordingly, BSC model demonstrates perspectives.

In order to implement BSC in the supply-chain management, each perspective has strategic objectives. On the right side, the SCOR model defines its performance measures in detail by decomposing performance attributes corresponding to each strategic objective.

Thus, organization could translate its vision into operational plans and actions by using BSC and SCOR model concurrently.

### **Lack of a comprehensive framework for decreasing risks of decision making**

Based on the suggested approaches, managers can use non-financial and financial measures simultaneously for generating value and improving organization's performance.

They also can determine required operations after setting strategic objectives by using BSC, strategy map and SCOR model, but this framework could be so problematic when these plans and operations are generating risk for the organization. In this case, they can be an obstacle for organization in approaching its vision. After setting objectives and corresponding operations, organization cannot identify which operation is generating errors.

Hence, it requires an approach to evaluate operations and programs, then specify factors generating risks and errors, and accordingly revise them. In order to overcome these problems FMEA model is recommended. By using these tools, we can identify potential failure modes in system, processes, products and services, and then prioritize them and define and decide some actions in order to prevent or decrease the possibility of these failures, and finally; we also document this process, which provides us with the source for future problems. FMEA technique is applied to analyze the possible failures, in order to raise the safety factor and consequently, customer satisfaction. One of the main differences between FMEA and other quality methods is that FMEA is an active method, while other methods are passive (are based on reaction): when failures occur, other methods define some reactions; however, reactions have lots of costs and resources. FMEA tries to estimate the potential problems and their risks and then decide upon actions leading to reduce or eliminate this risk. This kind of preventive act is an action against what could happen in the future. It is obvious that determining preventive actions in early phases of development needs lower cost and time comparing

to reactions. FMEA framework is presented in Figure 6.

After initial planning, a new program is represented. Then it must be decided whether it possesses enough reliability. In order to answer this question, all potential failure modes in our programs or operational activities are identified, and their importance is estimated. If their effect is more than an acceptable limit, some actions will be proposed to reduce the risk; this way, we can be assured that our programs or operational activities have proper reliability.

By using these tools, managers have enough potential to choose safe indicators and activities that are not generating risks and errors, and consequently, instruct the organization to obtain its goals.

## Conclusion

Supply-chain performance plays a key role in organization's success, goals achievement and especially in profitability. Hence establishing a performance measurement system in Supply Chain is strongly offered. So many researchers believe that continuous improvement in organization is merely obtained by measurement. BSC model can be used as an appropriate framework in measuring supply chain performances. Furthermore, by using BSC and specific tools and techniques such as strategy map, SCOR model and FMEA managers can readily translate organization's vision into strategic objectives and determine corresponding operations and suitable indicators for measuring organization's performance. The managerst has to finally select safe operations that are not generating risks and errors, and then implement them accordingly.

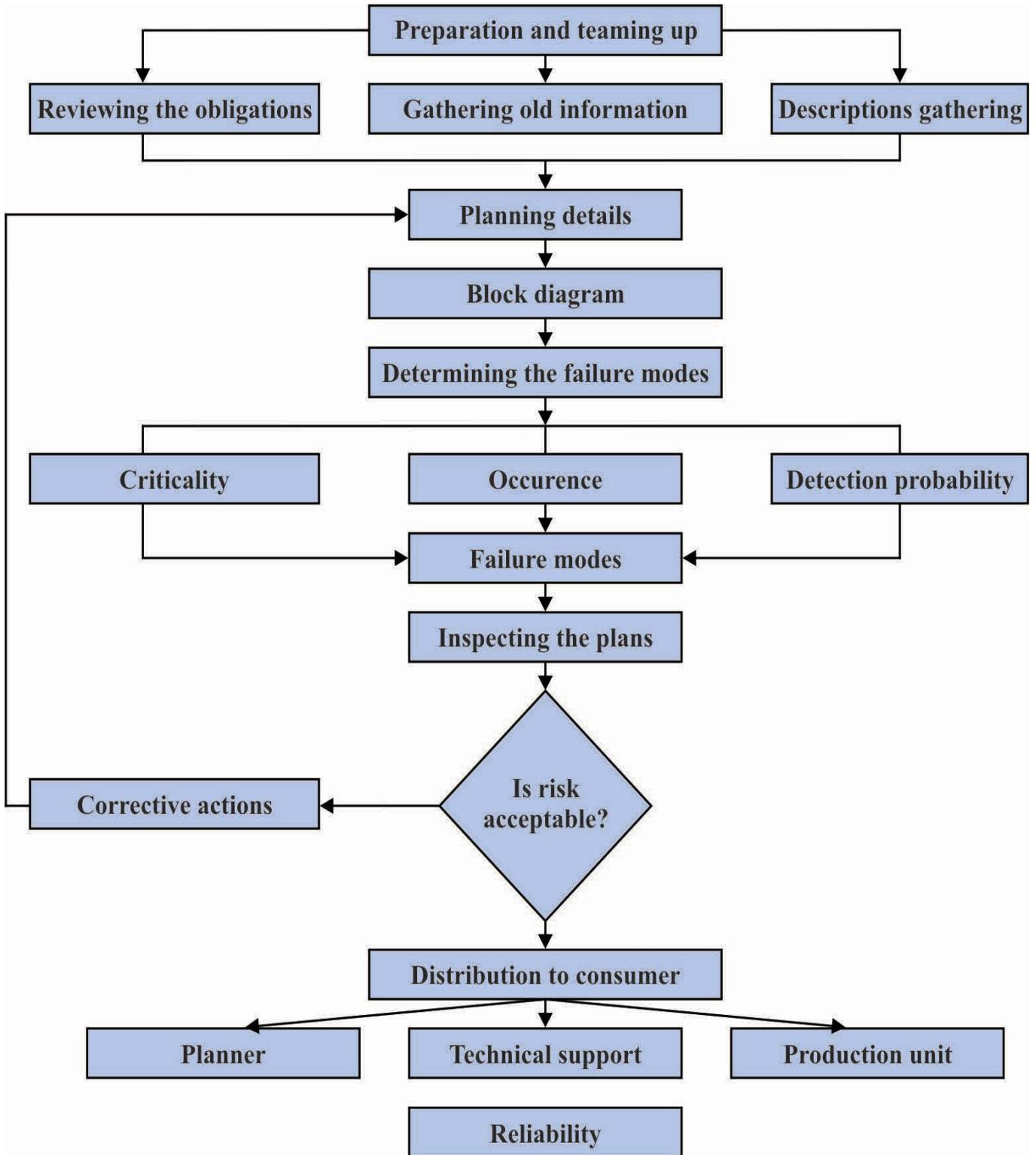


Figure 6 – FMEA framework

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# A STRATEGIC PERSPECTIVE OF SERVICES

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**Abstract**

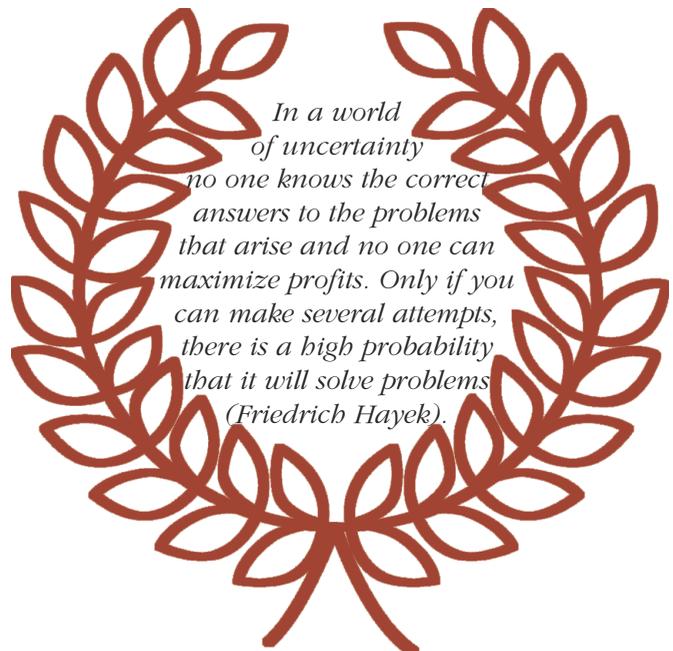
*This paper explores service sector and its potential to take into account different opportunities offered by traditional customer service and product related services. In order to meet the increasing more complex needs of customers and respond to decreasing product margins, product-oriented firms have developed a growing interest in extending their service business. Based on both literature and also the author's experiences through observing firms in Romania and Europe, this paper proposes a simple framework to aid practitioners and academics to better understand how the product-oriented firms must consider the ever increasing expectations of consumers and develop services that respond to them. The presented here also suggest as maintaining competitive advantages and achieving service-based growth advantages are becoming increasingly challenging for the most product-oriented companies.*

**Keywords:** service sector, customer service, product-oriented company, customization

## INTRODUCTION

Increasingly more complex customer needs and decreasing product margins are currently putting pressure on traditional product-oriented companies. As machine technology once changed an agricultural economy into an industrial economy, today's information technology is transforming our industrial economy into a service economy. The availability of computers and global communication technologies has created industries for collecting, processing, and communicating information.

Technological development has made possible the creation of whole new service sectors like telecommunications, software





development and engineering, to name just a few. New technologies have created economies of scale and scope which have allowed completely new service products to move through establishing networks or systems with little added cost [1].

Telecommunications firms were well positioned with networks to add new services based on IT investments. Lower-cost supply-chain logistics and improved management of supply-chain information were at the heart of just-in-time inventory management systems and rapid package delivery systems that contributed to improvements in productivity in some manufacturing sectors and wholesale trade. For example, the European broadband markets continue to strong growth. The growing demand for highly customized broadband-based services is a major growth factor, as customers are willing to pay that little extra for high-quality broadband services such as video on demand, pay-per-view TV and other attractive multimedia content. The broadband market

in Europe earned revenues of 27,302.9 million Euro in 2006, and estimates this to reach 93,941.3 million Euro in 2013.

This paper based, on both literature and also the author's experiences through observing firms in Romania and Europe, proposes a simple framework to aid practitioners and academics to better understand how the product-oriented firms must consider the ever increasing expectations of consumers and develop services that respond to them.

The paper is divided into three parts. First, a synthesis of the theoretical background is provided, and the respective implications for customer support service in product-oriented firms are highlighted. Then, the research methodology is explained. This is followed by a discussion of the results. The paper concludes by discussing implications for management and limitations of the study.

## THEORY DEVELOPMENT AND HYPOTHESES

The service sector now accounts for over 70% of total employment and value added in Europe Union economies. The growing globalization of service reflects changing business models where companies source intermediate services from specialized firms as an alternative to in-house production. This development has been triggered by technological advances, such as the development of broadband networks and the growing scope for digitization of services, as well as the emergence of a global labour market of highly skilled workers.

## The growth of the service sector in Romania

In services, a distinction must be made between inputs and resources. For services, inputs are the customers themselves, and resources are the facilitating goods, employee labor, and capital at the command of the service manager. Thus, to function, the service system must interact with the customers as participants in the service process. For some services, such as banking, however, the focus of activity is on processing information instead of people.

A service is an intangible personal experience that cannot be transferred from one person to another. Instead, a service is produced and consumed simultaneously. Service firms have the opportunity to build long-term relationships because customers conduct their transactions directly with the service provider, most often in person. In contrast, manufacturers traditionally have been isolated from the eventual end user by a distribution channel consisting of some combination of distributors, wholesalers, and/or retailers.

Service industries are now the largest contributors to employment and GDP in most countries. Although the significance of the service sector can vary significantly when comparing developed and developing countries, the rise of the service sector can be considered a general trend. In some Eastern European countries (see Table 1), the service sector is following the same pattern as in developed market economies – that is, the relative importance of services is increasing. However, the actual share of the service sector in GDP is still below the level of the development market economies. In Romania, for example, the agricultural sector still very large. The main explanation, however, is that during the Communist era more priority was given to the manufacturing sector [2].

The service sector in Romania is vast and multifaceted, employing some three quarters of Romanians and accounting for two thirds of GDP. The largest employer is the retail sector, employing almost 12% of Romanians. The retail industry is mainly concentrated in a relatively small number of chain stores clustered together in shopping

malls. In recent years the rise of big stores, such as Cora, Metro, Carrefour, Real, and so on, have led to fewer workers in this sector.

The second largest portion of the service is the business services. This includes the financial services, real estate, and communication industries. This portion of the economy is



	Romania	Hungary	Poland	Bulgaria
1980	–	34	–	32
1990	30	46	44	31
1999	53	–	65	60
2007	55.9	60	68	61.2

**Table 1** – Contribution of service sector to GDP in some Eastern European countries (%)

[Source: UNCTAD Handbook of Statistics]

largely concentrated in the major urban centres, especially Bucharest.

The education and health sectors are two of Romania's largest, but both are largely and have huge problems to be funded. Lack of investment was a serious problem for Romania higher education. If investments in tangible resources have as output the creation and development of physical capital, investments in the growth, education and training of human resources generate the human capital.

Vodafone Romania is the largest mobile operator in Romania, with 48% of the market. It has a GSM mobile network and has recently introduced 3G services. This company has transformed the traditional TDM network into an IP network which can interconnect with an IMS network in the future.

S&T Group is the leading supplier of IT consulting, solutions and services in Romania. IT software and service market for ERP (Enterprise Resources Planning) in Romania increased to some 250 million Euro for 2011. The market will continue to show an impressive growth rate of around 18% between 2008 and 2001. S&T Romania has a market share of 15% amongst local providers of ERP services and ERP systems integration.

The Western European broadband markets are generally much more saturated and mature than the Central and eastern Europe (CEE) markets. Therefore, the penetration of broadband lines is growing at a higher rate in the CEE region. The growth rate for the CEE segment of the market is expected to exceed 30 per cent, while the Western European segment will exceed 20 per cent.

### An investigation of firm's strategic response to market opportunities

In order to create new competitive advantages and exploit additional growth opportunities, product-oriented firms must consider and develop services that respond to expectations of customers. Moreover, most customers not only expect the proper functionality of the product but also desire additional support to increase the efficiency and effectiveness of their acquisition. That is, product-oriented firms must *shift the emphasis of their business from providing products to providing services*.

Faced with saturation of their core product markets, companies in search of growth are increasingly turning to services. Not all product manufacturers are so fortunate. Intel Corp., for instance, spent \$150 million to launch a unit whose function was to set

up data centres to host web sites for companies. After three years, Intel shut down the unit and announced that it was refocusing on its core microprocessor business.

The disbelief in the financial potential refers to higher overall profitability is limited by the disbelief that service revenue can constitute a major part in product-oriented companies. Compared to selling an item of machine equipment, selling services generates far less initial revenue. For example, a company creates additional revenue of 30,000 Euro by offering the production of additional mechanical components. In contrast, selling the customer another flexible manufacturing system generates additional revenues of half a million Euro. In addition, managers often believe that generating additional revenue through services can even lead to a loss in product revenue [3].

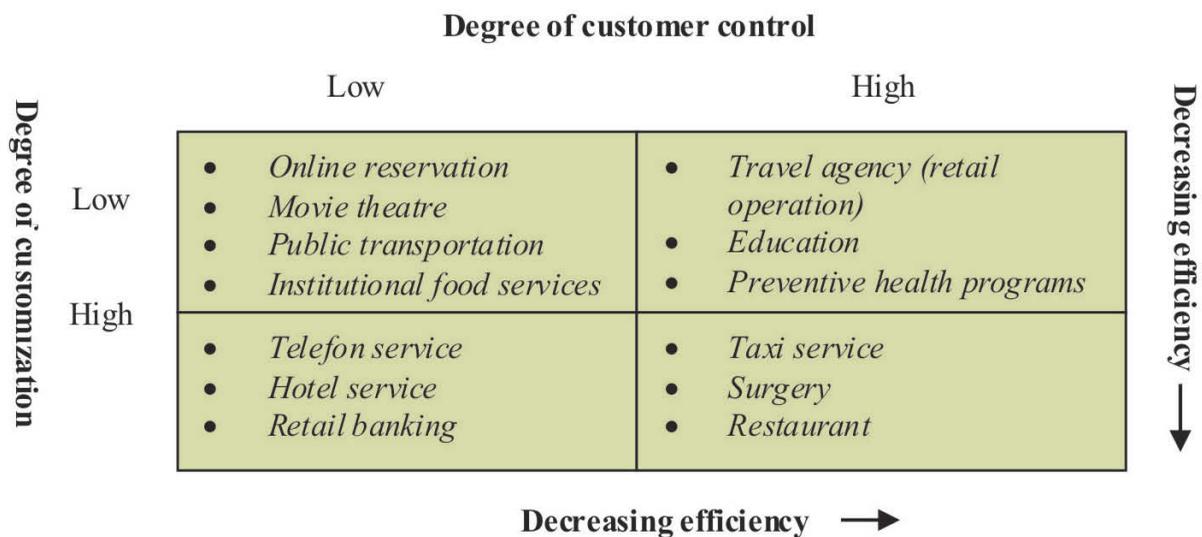
For example, when a company additionally offerd the operation of its compressors in its customer processes. Customers no longer invested in compressors themselves,

leading to a significant reduction in product revenue. With a cell phone service today, the phone can be used as a camera, video recorder, audio recorder, web browser, e-mail service provider, calculator, alarm piece, voice, music player, service locator, and so on. Building on these arguments, we hypothesize the following:

**Hypothesis 1:**

A greater emphasis on product-oriented firms to shift from providing products to providing service increases the efficiency and effectiveness

*Customization* develops services that meet each customer’s individual needs. Because both the customer and the service provider are involved in the service delivery process, it is easier to customize the service based on the customer’s specific instructions. Consequently, the provider can obtain higher prices, which lead to higher profit margins for the provider.



**Figure 1** – The customization/customer contact matrix [Source: John E.G. Bateson, *Managing Services Marketing: Text and Readings*, 3<sup>rd</sup> ed. The Dryden Press, 1995]

The customization/customer contact matrix (see Figure 1) is a table that illustrates the variety of relationships between the degree of contact the firm has with its customers and the amount of customization of the service available to consumers. The higher the level of customer contact, the higher the level of inefficiency because of the uncertainty introduced by customers. This idea is based largely on the concept of inseparability and the participation of consumers in the service delivery process [4].

From an operations perspective, the ideal cell is the low/low cell. In this cell, the firm can be isolated and run like any other manufacturing plant. The loss of efficiency implied by the high/high cell is compensated for by the price that can be changed. The firm fit into the high/high cell in the matrix will be in intensive contact with clients and will customize each service to meet the needs of each individual client. There will be little opportunity for economies of scale in this type of firm.

The goal of *standardization* is to produce a consistent service from one transaction to the next. Standardization leads to lower consumer prices, consistency of performance, and faster service delivery. For example, radio frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The tag consists of an integrated circuit on a silicon chip with an antenna. A reader emits a radio signal to activate the tag, read the stored data, and in some cases write data as well. For monitoring in supply chain, the tags are attached to shipping pallets but

could be incorporated into a product. Nevertheless the adoption of RFID depends upon reaching an agreement on a worldwide standard [5].

There are some limitations of customization, such as (1) customers may not be willing to pay the higher prices associated with customized services, (2) customized services take extra time to provide and deliver, and the customer may not have the luxury of waiting for the final product, and (3) customers may not be willing to face the uncertainty associated with customized services. For example, the automatic teller machine (ATM) is seen that a substitution of human labor with machines. However, for some customers, an ATM represents increased risk, less control of the situation, and loss of human contact. Thus, we expect a positive relationship would exist with efficiency of service company [6].

#### Hypothesis 2:

The higher the level of customer contact, the higher the level of inefficiency

#### Hypothesis 3:

A greater emphasis on standardization increases efficiency of service company

*Brand loyalty* is based on the degree to which the consumer has obtained satisfaction in the past. If consumers have been satisfied in the past with their supplier of service, they have little incentive to risk trying someone or something new. Brand enable customers to better visualize and understand intangible products. It reduce customers' perceived financial, social, or safety risk in

buying services, which are difficult to evaluate prior to purchase. Maintaining a long-term relationship with the same service provider helps consumers to reduce the perceived risk associated with the purchase. In addition, brand loyalty may also be higher for services due to the switching costs that can accrue when changing from one service provider to another [7]. Hence,

#### Hypothesis 4:

The greater customer satisfaction, the greater brand loyalty

*Economy of scale* is defined as the effect on efficiency, measured as average cost per unit of production. It is mostly measured as sales volume, corrected for price and quality differences, or as added value, per unit of input of labor, capital or other production factors. One source of economy of scale is division of labor because people specialize in a specific part of production they can perform their work more efficiently.

*Economy of scope* is defined as the effect on efficiency of the range of different operations using the same resources in different ways or at different times. For example, in the airline industry, an important effect of scope arises in connecting flights for the convenience of travelers. Having a wide portfolio of flights, or an alliance, allows one to offer better connections. Another economy of scope lies in combining flights between different destinations to reduce the number of flights. Another example for effect of scope is the combination of different products in a distribution channel to better utilize its capacity [8]. Wi-Fi (Wireless fidelity) has emerged as a leading method for trans-

mitting large amounts of data across short distances. This services encompasses the transmittance of data over high radio frequencies (2.4 GHz) designed for short distances such as within a hotel or office building. Hence,

#### Hypothesis 5:

A greater emphasis on economy of scope increases efficiency of service firms

There are clear economies of scope in adding services that improve the utilization of service capacity, particularly when additional activities can take place at times when few customers are present. For example, in travel agencies the sale of insurance may be added to the booking of travel and accommodation. In addition, there are considerable economies of scope in leveraging facilities by the addition of ancillary services, such as a wider range of medical services in a hospital, and addition of catering and accommodation in recreation.

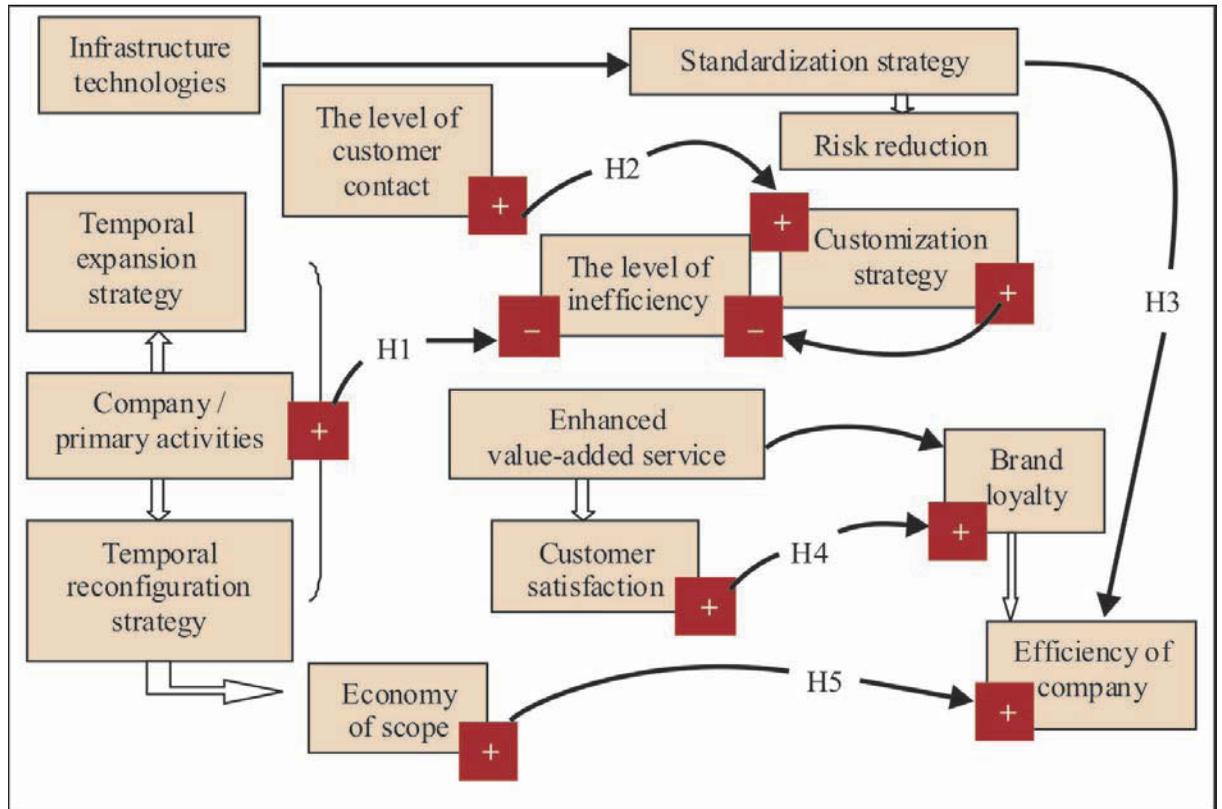
## EXPLANATORY MODEL

In this section we develop a framework model and discuss the operationlization of the major constructs in our model. A framework model for a firm in a service industry is illustrated in Figure 2. The key explanatory factors of this model include (1) *temporal expansion* by growth from services that add new activities to primary activities – new services, and new resources; and (2) *temporal reconfiguration* by growth from services that change the structure and control of activities within the primary processes.

The variables of this model include the following: the level of customer contact, standardization, customization, efficiency, brand loyalty, customer satisfaction, and economy of scope.

As illustrated in Figure 2, new growth opportunities stem from services. The sign plus (+) leads to an increasing of the variable and

minus (–) to a decreasing of the variable. On the other hand, the sign plus has a positive impact on the variable and minus has a negative impact on the variable. The relative importance of potential explanatory factors of efficiency of service companies and correlations between them will be tested in a future research.



**Figure 2** – A framework model

A customer will be satisfied if the outcome of the service meets his or her expectations. In fact, meeting and exceeding customer expectations may reap several valuable benefits for the firm. Expectation serve as benchmarks against which present and future service encounters are compared. Service firms must meet customer expectations in order to provide customers what

they want, when they want it, and where they want it so that the firms can strategically differentiate themselves from competitors [9].

The customer introduces a high level of variability into the service process, which will make reaching uniform productivity standards difficult. As a consequence, *standardizing output* will often be necessary if

the service delivery process involves a high degree of unpredictable involvement on the part of the client.

Establishing firms using personalized service create a loyal customer base, which becomes a barrier to entry by new services. For example, service firms with a substantial investment in facilities (e.g., airlines and hotels) can be considered as being capacity-constrained. In this case, each room or seat is referred to as a unit of inventory to be sold (to be rented). The cost of selling an additional unit of inventory must be low. The marginal cost of capacity additions is large, however, because of necessary huge facility investment.

There are clear economies of scope in adding services that improve the utilization of service capacity, particularly when additional activities can take place at times when few customers are present. For example, in travel agencies the sale of insurance may be added to the booking of travel and accommodation. In addition, there are considerable economies of scope in leveraging facilities by the addition of ancillary services, such as a wider range of medical services in a hospital, and addition of catering and accommodation in recreation.

Online personalization is primarily implemented through CRM (customer relationship management) tools combined with sophisticated data mining techniques that rely on acquiring information about customers and their preferences and analyzing this information to create customer profiles (*customization*).

The competitive service company should be able not only to take over a limited part

of the value-creating activities of its client, but should be able to take over the interconnected value-creating activities as well or should at least be able to „manage the interfaces” between the value-creating activities taken over and the interconnected value activities that the client continues to perform itself. That is, service companies have to undertake a very detailed and in-depth analysis of their clients’ value systems so that it becomes clear to the service company and to the clients how they should both co-operate to maximize the added value [10].

Processes and procedures are standardized and do not take particular circumstances into account or only allow for minor



adjustments to these particular circumstances. This approach can be highly effective for implementing a differentiation strategy in the service delivery, and at the same time can produce economics by reducing and even eliminating uncertainty and fluctuation. Process standardization in service delivery can be applied in any case where the client is not actually involved in the service delivery, or where standardizing the interaction with the client adds value to the client.

## CONCLUSIONS

The purpose of this paper is to develop a process-based conceptual framework for understanding and improving value-added services. This model inevitably includes much more than is already known about the creating growth with services. The research reported here has focused mainly on the added value of companies by which the product-oriented firms must shift the emphasis of their business from providing products to providing services.

Our results have the following practical implications. First, we noted that technology can be added to the service firm's competitiveness by lowering the service firm's costs or improving its competitive performance. Through the introduction of technology, service delivery becomes an activity in which the „human factor” is sometimes less involved, and in all cases differently involved. Clearly defining the role of technology and of the role of the people delivering services in a complementary and mutually reinforcing way can enhance the competitiveness of the

service firm and thus its growth, prosperity and, consequently, its potential to safeguard the employability of its people.

Second, the raising competitiveness through adding or extending service components can only be successful if the firm is able to „anchor” the service within the firm itself and if the firm as a result is able to „lock in” customers. For example, switching costs for clients are raised and, as a result, the firm succeeds in „locking in” clients.

As for earnings a service firm has several strategic alternatives. The first alternative means increasing the available capacity, which of course is an option at least as long as there are positive economics of scale. The other alternative, however, to increase capacity, is to increase the productivity of the service process (efficiency) or to increase the value of one unit of time for the customer – that is, leveraging capacity.

Finally, building competitive advantage by using intangible assets protects competitive advantage against imitation, mainly due to the intangibility of the assets and the resulting causal ambiguity. It becomes unclear to an outsider which assets are precisely used to create competitive advantage and how the creation of competitive advantage by using these assets is achieved.

This paper is limited in terms of the experimental data, because the model has not been tested on the market. To achieve a more comprehensive view of service strategy, future research should examine the explanatory factors and the correlation between them by experimental testing of our model.

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# TRENDS IN THE ROMANIAN ADVERTISING INDUSTRY

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## Abstract

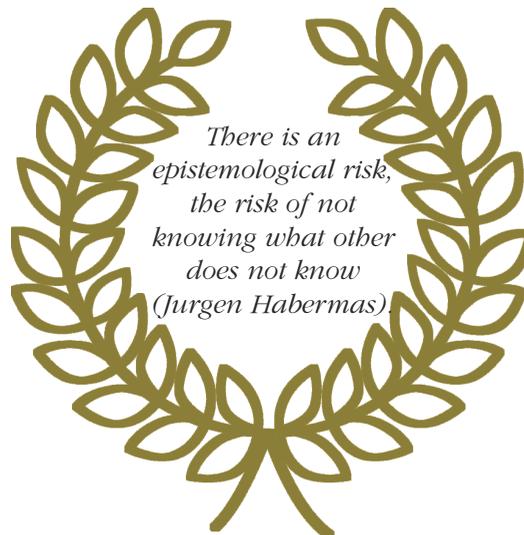
All Central and East-European countries have experienced significant economic growth over the last 20 years. Romania has lagged behind for several years but is currently experiencing privatization and economic growth. As the Romanian market has spawned many local entrepreneurs and attracted many global marketers, likewise an advertising industry consisting of many local and international agencies has developed to serve their needs. The present paper summarizes and classifies the different stages of the industry and its competitiveness. It extrapolates the findings to the competitive advantages created by advertising and the competitiveness of the advertising industry clients.

**Keywords:** advertising, competitiveness, market, industry

After the major political changes in the late 80s the Central and East-European countries have experienced significant economic growth due to political reform, privatization, and access to foreign capital. However the rate and timing of economic growth has varied from country to country. Romania has lagged behind for several years but is currently experiencing privatization and economic growth. Foreign companies established subsidiaries and started doing business in the country. Hundreds of local companies were

formed and started to compete in all types of industries. All businesses started to use marketing tools to promote their products and services. As a consequence, the advertising industry experienced a tremendous growth. An examination of the evolution of the advertising industry represents an excellent window to observe and analyze the overall economic growth (Keegan, 2002).

As the Romanian market has spawned many local entrepreneurs and attracted many European and global marketers, likewise an advertising



industry consisting of many local and international agencies has developed to serve their needs. These agencies provide marketing strategy and brand development consulting as well as creative advertising and media services. As competition among marketers increases so has competition among advertising firms. The purpose of this paper is to describe trends in the advertising industry in Romania. The present paper summarizes and classifies the different stages of the industry and its competitiveness. It extrapolates the findings to the competitive advantages created by advertising and the competitiveness of the advertising industry clients.

Sporadic and non-formalized attempts have been made to analyze the structure and evolution of the marketing and advertising

industry in the emerging markets of Central and Eastern Europe. Testimonials have been gathered by journalists, stories and rumors have been used to investigate the infrastructure, the trends, and the sustainability of the industry. However, the academic literature has only lately showed interest in the topic. The research done for this report identified only two studies dedicated to some aspects of the Romanian advertising industry. This paper will try to uncover the developments that took place in the last over 20 years and to analyze the sustainability and effectiveness of the advertising industry in Romania, the second biggest market in Central and Eastern Europe outside the former Soviet Union (for a country profile see Table 1).

<b>Area</b>	91,700 square miles	237,500 sq km
<b>Border with</b>	Bulgaria, Hungary, Moldova, Serbia Ukraine	Borders the Black Sea
<b>Population</b>	22,329,977 (July 2005 est.)	Second most populated country in Central and Eastern Europe (outside the former Soviet Union)
<b>Population Growth Rate</b>	-0.12% (2005 est.)	
<b>Distribution of Population</b>	52 percent urban > 16 percent 60 years or older	
<b>Cities</b>	Bucharest (capital city) Cities with over 300,000 inhabitants: Constanța, Timișoara, Brașov, Cluj, Iași, Galați	2.2 million
<b>GDP</b>	\$186.4 billion (2005 est.)	
<b>Ethnic Composition</b>	89 percent Romanian 6.6 percent Hungarian	
<b>Literacy Rate</b>	98 percent	

**Table 1 – Romania. The Country Profile**

[Source: The Intelligence Economist Unit, Central Intelligence Agency, World Fact Book]

## Literature Research

The emerging free-market economies of Central and Eastern Europe are experiencing an advertising „renaissance,” yet not enough information on industry activities has been captured in the literature (Rhea, 1996a). Most information comes from press releases and news stories.

Research reports that were made available in the last decade can be clustered into: (a) interest of Western advertising agencies in these markets, (b) uses of various types of advertising in Eastern European countries, and (c) strategic counsel and advice (Duncan and Ramaprasad, 1995).

Central and Eastern Europe advertising market did not bring by itself a lot of attention from established ad agencies from the West. Caution characterized their market entry approach. Frustration of dealing with a different business mentality and different culture were at times overwhelming (Rhea 1996b).

Most of the multinational advertising agencies were pulled into the newly emerging markets by their clients in the Western markets (Stefanou, 1992). Consumer product companies such as Johnson & Johnson, Coca Cola, McDonalds, Colgate Palmolive, Kellogg, Mars, served as change agents and pressured their agencies to support them in the new markets they entered. Agencies started to operate in Central and Eastern European markets under non-equity affiliation agreements with local companies rather than joint ventures (Bowes 1990).

The role of advertising in Western and Eastern Europe was different. While consumers in Western Europe were familiar with the advertised products and ads were used to differentiate between competitive offerings, in Eastern Europe advertising was primarily used as a tool to make rise awareness of unfamiliar products (Heyder et. al. 1992, Stefanou, 1992). A variety of non-traditional advertising campaigns were developed

and used to promote events or to explain government actions. Advertising campaigns were designed to help the population understand the privatization process, the public offerings for state owned companies, investing in the capital market, etc. (Lee and Kitchen, 2005).

Information available for different countries in Central and Eastern Europe is limited and differ along the West-East direction. The Czech Republic, Hungary, Russia, and Poland received most of the academic attention. Other countries did not constitute fertile topics for academic research. Romania, Bulgaria, and the states that constituted the former Yugoslavia did



not receive much attention. Except for the two studies authored by Rhea (1996a and 1996b) published in the Journal of Euro Marketing, studies that are exploratory and informative, there are no articles published in the academic literature that describe or analyze aspects of the advertising industry in Romania.

### Methodology

A competitive analysis of the Romanian advertising industry was performed along dimensions familiar to the competitive analysis method: (a) internal rivalry in the industry, (b) bargaining power of suppliers, (c) threat of new entrants, (d) threat of substitutes, and (e) bargaining power of the industry clients. Though ultimately addressing the final consumer, the advertising industry is situated in a business-to-business condition. Given the scarcity of research and research information on the Romanian advertising industry after the fall of the communist regime, the analysis will employ an exploratory research methodology in the context of theoretical discovery (Zaltman

et. al. 1982). The analysis will provide information that might be useful for inquiry into areas related to advertising strategy such as role portrayal of men and women in advertising, the impact on advertising on the local consumer, etc.

To accomplish the task several interviews have been conducted with several advertising agencies senior managers, media specialists and managers, and academic researchers and faculty. The interviews were conducted for a period of several months in Bucharest, Romania, in several cities in central Romania, and via e-mail. The information was supplemented with insight from many discussions with individuals and families during the on-site research period of over two months. The data collection instrument was developed in time, through an emergent design process with new questions added as the understanding of the different aspects of the advertising industry became more and more clear. Discussions were conducted in several stages with e-mail follow-ups when necessary. A breakdown of the respondents is provided in Table 2.

Respondents	Number of Interviews	Length of Interviews (Hours)
Advertising Agency Personnel (Management)	6	8
Media (TV, Radio, Press)	7	4
Academic Researchers and Business Faculty	9	13
Local Government Officials	4	4
<b>Total</b>	<b>26</b>	<b>29</b>

**Table 2** – Breakdown of the Respondents for Industry Analysis



### Industry Analysis

Romania's change to a market economy has been followed by notable growth in the variety and quality of marketing activities. Promotional tools have been extensively used. As an example within the general area of promotion, only advertising activity increased tenfold. Total advertising rose from USD 27 million in 1993 to over 310 in 1999, with multinational companies active in the industrial sector and mobile

operators being the top advertisers. Next, an in-depth competitive analysis will be performed.

### Bargaining Power of Suppliers

Multiple media outlets have been used and are used by advertising agencies. Media includes television, radio, movie, newspaper, journals, and magazines as well as outdoor vectors such as billboards, signs, etc. Television was and still is the predominant media, with a commanding 60 percent of the total advertising spending, followed by the press, outdoor advertising, radio and movie advertising. The television system includes five state-owned national networks, a large number of state-owned local networks, and a multitude of privately-owned networks which tend to cover the whole country (Examples: ProTV, Antena 1, Antena 3, Prima TV, Kanal D, Acasă, B1 TV, Realitatea TV).

Radio also represents an important outlet for advertising. There are three national state-owned AM radio networks which can be characterized by their target audience segment: popular, cultural and youth. In addition, there is a national FM network (Europa FM) and a large number of FM sta-



tions in Bucharest and other major cities, which have a broad audience appeal, of which the most popular are: ProFM, Radio 21, Radio Total, Kiss FM. In the last several years radio stations have proliferated all over the country and smaller and medium sized cities have a wide choice of programs.

The press includes both newspapers (daily and weekly, covering the whole country) and a growing number of magazines. Although only 20 percent of the population is reported to read one or more newspapers a day, national dailies are important opinion vectors. There are more than 20 national dailies, of which the most notable are: *Adevărul*, *Evenimentul Zilei*, *Ziua*, *Gândul* and *România Liberă*. Several of them have established their readership based on political

philosophy (such as *România Liberă*, right wing oriented newspaper or *Adevărul*, a left wing oriented daily newspaper); others are mass-market newspapers (such as *Evenimentul Zilei*, the most read periodical), or sport-oriented newspapers. There are also daily and weekly newspapers published in major cities. Specialty publications (i.e. sports, business, entertainment and family) are a major aspect of the weekly newspaper and magazine segment. Little more than 50 percent of the population listen to the radio (mainly in the mornings) as compared with over 60 percent that watch television daily.

Movie advertising is a rapidly growing form of advertising as it allows a high quality message to be delivered.

Specialized services, such as market research and market testing are available from independent suppliers (IRSOP and IMAS) as well as established institutes (Institute of World Economy and Romanian Chamber of Commerce and Industry). However, experienced companies and individuals carrying out marketing studies are rare. Nielsen Advertising started to conduct business in the country several years ago.



The best-known business newspapers and journals in English are the following:

- Quarterly Bulletin (economic, financing, monetary and credit trend information together with statistics of the National Bank). Publisher: National Bank;
- Romanian Insights. Publisher: Romanian Chamber of Commerce and Industry;
- Bucharest Business Week. Publisher: Americelt Publishing SRL, Bucharest;
- In Review, Romania's Magazine for Business (monthly), and The Business Review (weekly). Publisher: Business Media Group SRL, Bucharest;
- Romanian Economic Daily. Publisher: Nine O'clock Publications;
- Other publications in English are: Romanian Economic Newsletter (published quarterly in the USA to report on and analyze Romanian economic developments); Business Central Europe (published monthly by the Economist Newspaper Group, London); and Balkan News (a weekly newspaper published by Balkan News in Athens).

Advertising outlets are numerous and in a large variety. However, the need for

advertising space is growing at an impressive rate. We appreciate the bargaining power of suppliers to be moderate to high. There is a consensus among the respondents that the power of suppliers over the advertising agencies is expected to consolidate and grow in the next period.

### **Rivalry Among Existing Competitors**

The advertising agency industry is experiencing rapid growth of both branches/local representatives of international ad agencies and domestic agencies. Major agencies with international affiliation include: Ogilvy & Mather Advertising, McCann-Erickson Romania, Ammirati Puris Lintas Bucharest, Tempo Advertising, Graffiti/BBDO, Saatchi and Saatchi, and Young and Rubicam. Practically, at present, almost all important multinational advertising agencies are present and conduct business in the Romanian market.

The interviews and discussions with media and ad agencies representatives made possible to identify several stages in the expansion of the advertising industry from 1990 to the present. There are five stages of the advertising industry development in Romania include:

- 1. Pioneering (1990–1993)** – Many stories have been gathered on the first steps in the industry. Marketers coming for everywhere (both domestic and international) were willing to advertise the products but there were not specialized services. The few local advertising businesses (mainly TV and radio stations) were unprofessional, populated by individuals with no training in advertising.



Ranked by 261 respondents representing top 100 ad consumers	Strategy orientation	Most creative	Overall Ranking
Leo Burnett & Target	1	1	1
McCann Erickson	2	3	2
Next Cap	3	2	4
Young & Rubicam	4	Not in the top 10	Not in the top 10
Graffiti BBDO	5	5	5
Saatchi & Saatchi Romania	6	8	6
Ogilvy & Mahler	7	Not in the top 10	Not in the top 10
Tempo Advertising	8	4	7
Grey Worldwide Romania	9	10	10
Focus Advertising	10	Not in the top 10	Not in the top 10

**Table 3 – Major Advertising Agencies**

[Source: Advertising Maker 2004]

**2. Market Growth** (1993–1997) all major ad agencies started to be interested and established their presence in the market (except for the Japanese advertising agencies). Most bought a small local company (except for Grey). Competition increased substantially and became intense by the end of the period.

**3. Emergence of local creative agencies** (1997–2001) – characterized by a new wave of local start-ups (specialists from the big multinationals started their own businesses). The spin-offs are using now professionals such as: Tempo Advertising, ADDV, Headvertising, NextCap (20-30 of these competing with the big ones on niches they specialize in).

**4. Diversification and specialization** (2001 – to the present) (such as Grey: media, BTL, serving different industries in research, strategy consulting, direct marketing, branding).

**5. Maturity and efficiency** (an emerging

stage) several major companies show signs of limitations – two with significant market share were already in trouble: Darcy and TBWA showing signs of serious weaknesses. Among other companies that signaled weaknesses is Ogilvy & Mather. The key words are efficiency and survival with small margins.



The first generation of ad agencies included staff neither trained nor experienced in advertising. Positions were filled mostly with engineers. The country overproduced engineers. In 1989 almost 70 percent of students were studying engineering. This represented a general characteristic of all countries in Central and Eastern Europe. Heavy industrialization increased the demand of engineers. However, after the communist regimes collapsed and the markets started to function, the well trained engineers had to find other type of jobs and many entered the advertising agencies.

Brand advertising as such did not begin in Romania until about 1996. First ad agency staffs had no training, experience, models to use. A period of learning by doing followed as mentioned by the majority of respondents.

Early 1990s was totally primitive advertising. Clients were underdeveloped with respect to their marketing. Now they are becoming more demanding. Major clients of the advertising agencies entered the market with standardized strategies developed somewhere else. Coca Cola came into Romanian market early in 1990s. They came in with standardized ads used elsewhere in Eastern Europe.

The first Coca Cola campaign adapted to the Romanian market was for Coke Light in 2001. The campaign initially ran in 8 European countries. However

Coke was doing local sales promotions in late 1990s.

As mentioned above, the competition in the advertising industry increased dramatically in the last ten years and the market is now mature with most of international ad agencies present in the market and surrounded by scores of local niche companies. The rivalry in the industry is high.

### **New Entrants**

As mentioned by all respondents, the main multinational agencies are already present and doing business in the Romanian advertising market. A multitude of spin-offs emerged in the past five years or so. Almost everybody that was expected to enter the market is already in. Therefore the threat posed by new entrants is moderate to low and decreasing.



## Substitutes

Substitute products in the advertising industry are limited. They can be the in-house production of ads and in-house development of advertising campaigns. Only big companies can afford to use this method and only for minor projects. Another relatively cheap substitute is offered by the academic community. Professors and students in business schools can offer consulting in the area and are able to design promotional campaigns for businesses. However, their expertise is limited to small, unsophisticated projects.

We can conclude that the threat of substitutes is low to moderate and is not expected to increase in the foreseeable future. This represented the majority opinion of both advertising agency employees and managers interviewed as well as the opinion of academic researchers.

## Bargaining Power of Clients

The major clients of advertising agencies operating in Romania and therefore

the major consumers of advertising are presented in Table 4. Procter & Gamble, followed by Unilever, dominates the advertising market. Consumer goods marketers represent the biggest clients advertising agencies have. Table 4 ranks the most important clients by the advertising media they use.

The bargaining power of the clients can be considered as high and increasing in time. As the competition increases in the consumer goods markets, the manufacturers will become more demanding on advertising agencies. However they will also generate more business for the advertising industry (James and Hill, 1991). For example, in 2003 the consumer goods sales increased by over 10 percent (Advertising Maker, 2005). Accordingly, the consumer goods marketers got excited and increased their advertising budgets by 10 to 20 percent. The top marketers invested over 80 percent of their advertising budget in TV ads. Much less money went to radio, press, and internet.

Company	TV usage	Advertising Budget (Million Lei)
Procter & Gamble	1	143
Unilever	2	75
Coca Cola	3	51
Wrigley's	4	41
Colgate Palmolive	5	40
Elite Romania	6	36
Bierersdorf	7	32
Kraft Foods Romania	8	31
Brau Union	9	30
Henkel	10	30

**Table 4** – *Main Advertising Clients. Top Users of Media*  
[Source: Advertising Maker]



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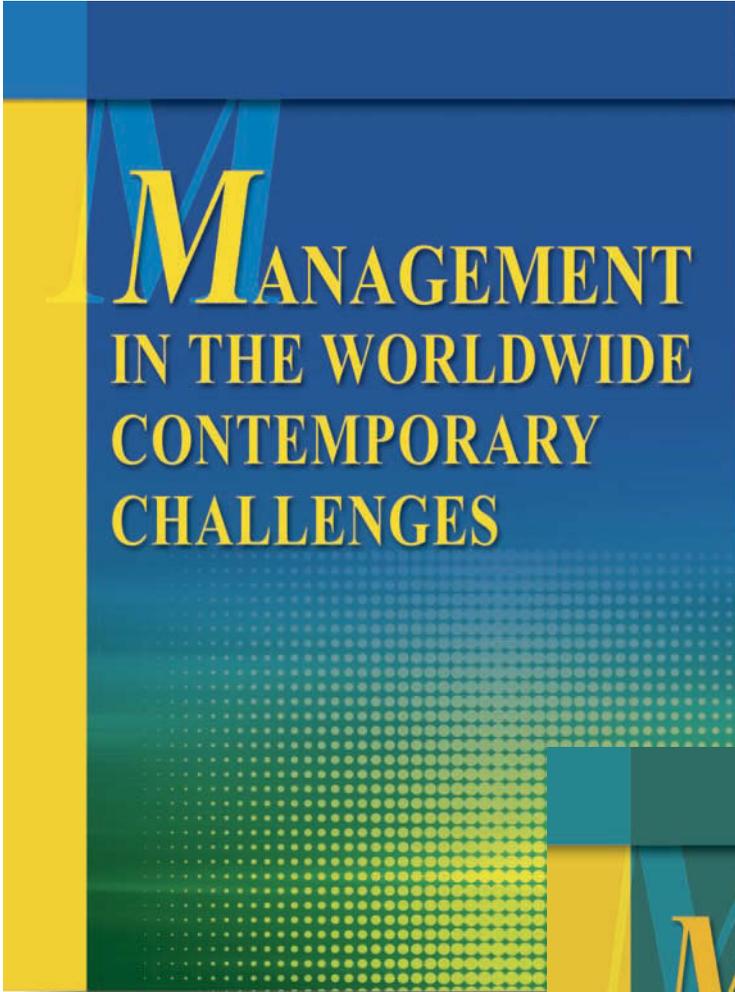
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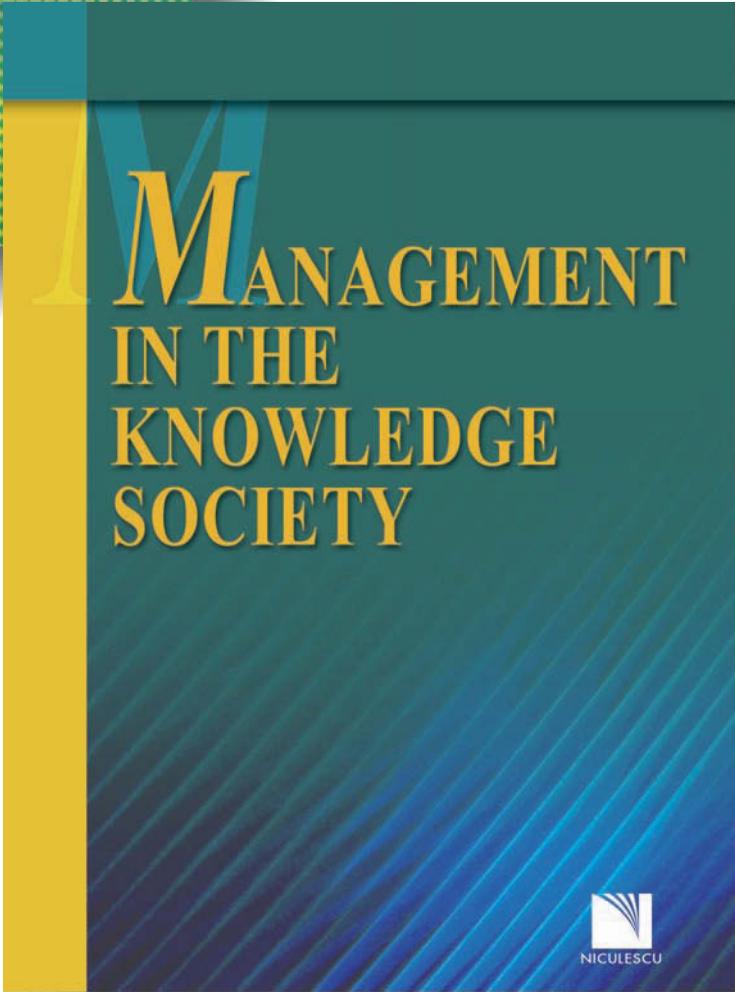


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