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THE USE OF THE DECISIONAL TREE WHITHIN STRATEGIC DECISION MAKING PROCESS

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Abstract: A decisional tree makes it possible to evaluate and compare the potential results of a strategic decision by forecasting future events under the form a complex diagram and determining a set of specific values which are associated to each of the decisional value taken into consideration. The paper focuses on the practical implementation of the decisional tree method using the example of the restructuring strategy elaborated by an enterprise which faces the exigence of adopting the decision for reconversion.

A decisional tree makes it possible to evaluate and compare the potential results of a strategic decision by forecasting future events under the form a complex diagram (its resemblance with a styled tree drawn from left to right is the one thing that gave the name of this method), and determining a set of specific values which are associated to each of the decisional value taken into consideration [1]. Thus, each decision depends on the results of a random event, which could not be identified precisely at the time the decision was taken, but which could be estimated based on statistical-mathematical investigations. The structure of a simple decisional tree includes the following main elements:

- *The decision points*, also called decision knots are usually symbolized by a square and they mark the moments when managers must choose, out of many possible choices, a course of action (a strategic option) which will be adopted in order to reach the strategic objectives;
- The possible *decisional options* are represented by arches or ramifications which emerge from a decisional knot. An option (arch) can lead to a consequence (result) or it can continue within a multi-sequential tree with another decision point or opportunity point;
- *The opportunity points,* symbolized by circles, mark the random events or the states of nature which occur during the strategic decisional process. The states of nature or the events are also symbolized by arches which emerge from opportunity points. Each ramification which represents a state of nature can result in a consequence, in a new decisional knot or opportunity point.

When *drawing the decisional tree* one must start from left to right, from the initial decision point, the decisional options of which are symbolized by arches, emerging from this initial knot towards the right. Hereinafter, new opportunity or decisional points are added according to the decisional events or situations estimated to occur after the initial decision. Thus, the decisional tree advances to the right up to the points where the waited-for consequences or results are reached. We must show that a complex tree adopted for the strategy elaboration process (which implies a sequence of strategic decisions taken at different periods of the forecasting process) can be interpreted as a re-union of simple trees, each representing a single period of time. In this way, the complex (multi-sequentional) tree can be extended up to the forecasting limits. Therefore, then main issue which arises during the strategy elaboration process is that of establishing the optimum trajectory of decisions, so that at the end of the forecasting process the performances anticipated by each company reach their maximum limit.

Contrary to the elaboration sequence of the decisional tree, *the solving process* (which consists in a comparative analysis of alternatives) *begins from the right of the tree towards the initial starting point*. Calculations are, thus, made from right to left using the "*roll-back*" principle, by evaluating the optimum mathematical expectation of each decision point. The mathematical expectation for the decision knot is usually determined with the help of the following equation [12]:

$$E(Vki) = \sum_{j=1}^{n} p_{kij} \cdot \sum_{t=t_k}^{T} \frac{c_{kij}(t)}{(1+d)^t} - \frac{i_{ki}}{(1+d)^{t_k}} \quad (1)$$

where: "k" represents the decision point; "i" – decisional option index; "j" – the running number of the state of nature; "t" – the running number of the current year; T – the forecasting process; $E(V_{ki})$ – mathematical expectation of option "i" from decision knot "k"; $c_{kij}(t)$ – the consequence (result) estimated for each state of nature at time "t"; p_{kij} – the probability of the state "j" for option "i" from the decision knot "k"; i_{ki} – the investments needed to implement option "i" of the knot D_k; t_k – the running number of the year corresponding to the decision point D_k; d – the rate of interest used to update the result.

The mathematical expectation with the maximum value corresponds to the most favorable alternative within the decisional plan:

$$V_k^* = \max\{E(V_{ki})\} \quad (2)$$

where V_k^* represents the optimum decisional option at the knot "k".

The solving methodology of the strategic decisional tree usually undergoes the following stages: making the scenario of the strategic problem that needs to be solved; the graphic representation of the decisional tree under the form of an open graph; determining the decisional consequences of each option and estimating the investments; calculating the probabilities of occurrence and manifestation of random events; evaluating the decisional tree by determining the mathematic expectations of the options of each decision point and applying the "*roll-back*" procedure; describing the chosen strategy pattern as a sequence of optimum strategic decisions in each decision point.

The actual practical implementation method will be singularized further on, using the example of the production strategy elaborated at UTILAJUL, an enterprise which produces mining equipment and spare parts [6]. Allowing for the global strategy coordinates elaborated within the company, *the restructuring scenario* of the production system at SC UTILAJUL has considered the following strategic alternatives:

V_1 – reducing the production of traditional mining equipment and spare parts and assimilating the production of civil and industrial construction equipment. If the demand increases, thus covering gradually the production capacity, the activity will continue at the same intensity. If the demand remains reduced after diversification, UTILAJUL will adopt an extensive orientation in order to reach the objective of increasing the market segment. For this, there are two alternatives: continuously improving of the quality of products or setting up their own market, both ensuring the market extension by supplying all categories of beneficiaries in the country or abroad;

V_2 – maintaining the same field of activity for two years and disinvesting by involving a considerable share of the company's assets. If the reaction of the market is a favorable one, the activity can continue at the same parameters based on the fact that a reduced production corresponds to stable segments which needs spare parts for the mining equipment in scarce quantities and with specific characteristics, fit for certain categories of equipment. If the demand becomes stable at a much reduced level, after the second year the company will diversify its activity by assimilating spare parts for electronic and electro-technical equipment and it will expand its area of services;

V_3 – the company reduces considerably its production activity – which refers to the assembly of spare parts purchased from the country or from abroad as mining or/and nonmining equipment. At the same time, service and consulting activities begin to develop for the exploitation of a wide range of equipment. Fixed assets which are in excess will have been retained by the end of the year 4, after which, if the activity of the company develops favorably in that direction, these actives will be recovered through disinvestments. In case the enterprise faces difficulties regarding this production restructuring option (difficulties arouse mainly from the great efforts involved by such a radical changing process), the production process will continue, only this time it will turn out spare parts for a wide range of equipment; there is always the option to develop interconnected activities like commercialization, consulting and service assurance.

The decisional tree based on the three main options of the strategic scenario is *represented graphically as an open graph*, see Figure 1.

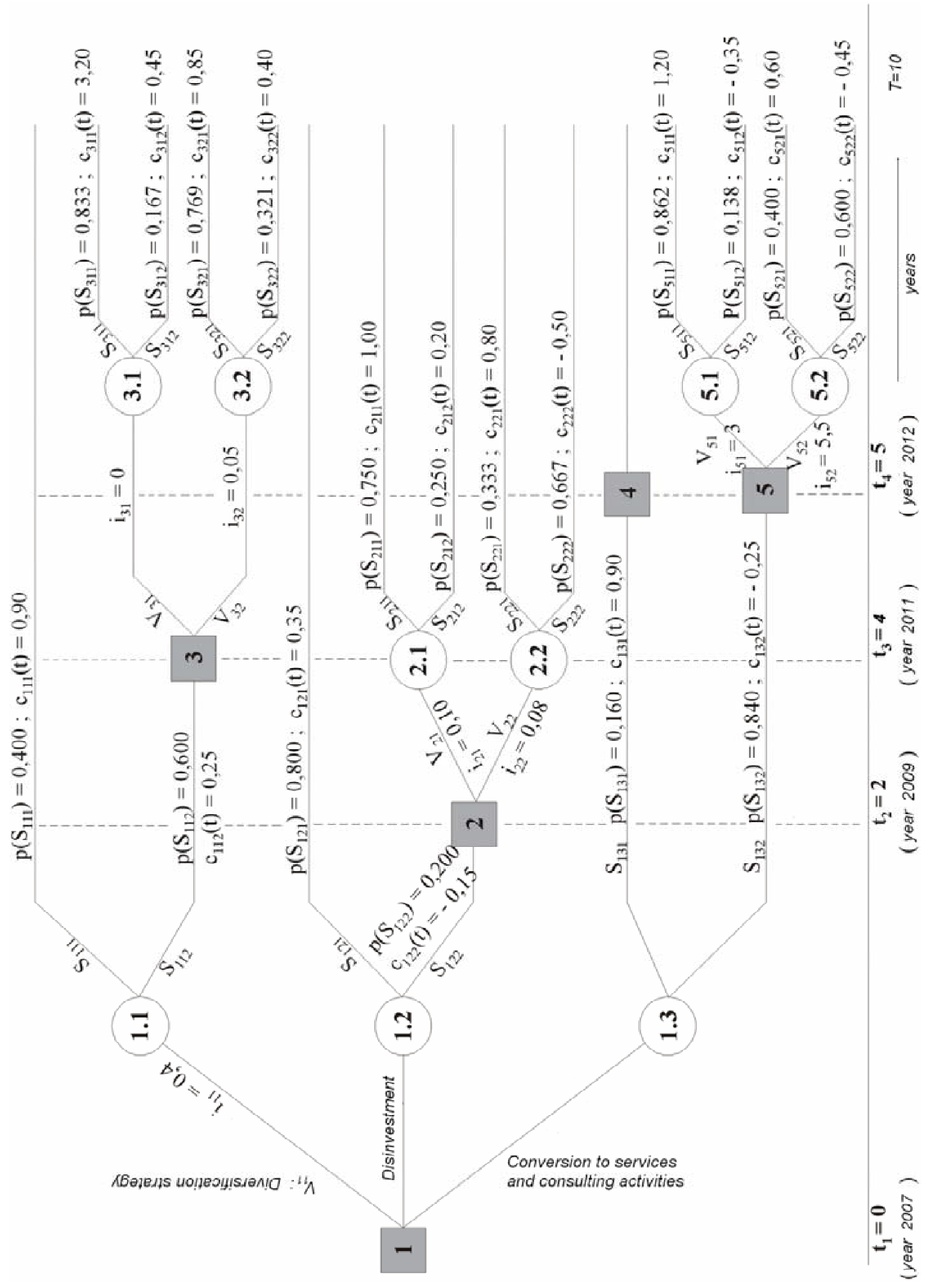

Figure no. 1: Decisional tree

Evaluating the investments for the implementation of strategic options requires expert appraisals or laborious feasibility surveys. The expertise implies an examination by experts, based on their experience with similar situations, on the investments required by each strategic action (without doing special calculations, and using instead a comparison with solved cases from the past). Feasibility surveys perform a more precise evaluation of the investment (using project layouts and expense estimates); however, they imply both very important calculations and a larger period of time.

The results (like profits or costs) can be forecasted using the same methodology, just like in the case of investments. At the time the expertise or the feasibility surveys were performed, specialists make use of a data base which contains price lists, price lists for services and utilities, taxes, salaries and other variables that were taken into consideration during the analysis. In the long run, the cost components undergo modifications, usually on an ascending line. Concurrently, exchange rate changes, the potential increase of labour productivity, as well as the decreasing efficiency principle, are some elements which can be taken into consideration by introducing money updated factors into the formulae of mathematic expectations [7]. Table 1 shows the estimated values of the parameters of the decisional tree from figure 1.

Allowing for the fact that the period of time T, which was estimated while the strategic alternatives were being formulated covers ten years, it is considered that in order to make a comparison of the data it is more convenient to express the investments, profits and estimated costs per option in USA dollars. Under the circumstances, the rate for the updating of the sums of money involved in the opportunity study of strategic options was set to 15%. In table 1, the estimated results are shown as consequences from the year t, symbolized by c_{kij} (t) for each strategic option „i", from each decision point "k" and state of nature "j".

Table no.1: Parameter variables of the strategic decision tree

Decision knot k and time t_k	Options Vki from decision points k	Investments per option		States of nature		Probabilities of the states of nature		Profits (+) / Losses (-) during the year t	
		Code	mil $	Code	Specifications	Code	Values	Code	mil $/year
1 t_1= 0 (2007)	V_{11} Diversification (assimilating construction equipment)	i_{11}	0,4	S_{111}	Keen demand	$p(S_{111})$	0,400	$c_{111}(t)$	0,90
				S_{112}	Slack demand	$p(S_{112})$	0,600	$c_{112}(t)$	-0,25
	V_{12} Maintaining the present field of activity and disinvesting	i_{12}	0	S_{121}	Keen demand	$p(S_{121})$	0,800	$c_{121}(t)$	0,35
				S_{l22}	Slack demand	$p(S_{122})$	0,200	$c_{122}(t)$	-0,15
	V_{13} Narrowing down production activities and developing service and consulting activities	i_{13}	0,15	S_{131}	Keen demand	$p(S_{131})$	0,160	$c_{131}(t)$	0,90
				S_{132}	Slack demand	$p(S_{132})$	0,840	$c_{132}(t)$	-0,25
2 t_2=2 (2009)	V_{21} Specializing in spare parts fit for certain categories of equipment	i_{21}	0,10	S_{211}	Keen demand	$p(S_{211})$	0,750	$c_{211}(t)$	1,00
				S_{212}	Slack demand	$p(S_{212})$	0,250	$c_{212}(t)$	-0,20

	V_{22} Diversification by assimilating spare parts for electric and electronic equipment	i_{22}	0,08	S_{221}	Keen demand	$p(S_{221})$	0,333	$c_{221}(t)$	0,80
				S_{222}	Slack demand	$p(S_{222})$	0,667	$c_{222}(t)$	-0,50
3 t_3=4 (2011)	V_{31} Improving quality	i_{31}	0	S_{311}	Keen demand	$p(S_{311})$	0,833	$c_{311}(t)$	3,20
				S_{312}	Slack demand	$p(S_{312})$	0,167	$c_{312}(t)$	0,45
	V_{32} Own commercial network	i_{32}	0,05	S_{321}	Keen demand	$p(S_{321})$	0,769	$c_{321}(t)$	0,85
				S_{322}	Slack demand	$p(S_{322})$	0,231	$c_{322}(t)$	0,40
4 t_4=5 (2012)	V_{41} „Status - Quo"	i_{41}	-1,8	S_{141}	Keen demand	$p(S_{141})$	0,600	$c_{141}(t)$	1,15
5 t_4=5 (2012)	V_{51} „Status - Quo"	i_{51}	3	S_{511}	Keen demand	$p(S_{511})$	0,862	$c_{511}(t)$	1,20
				S_{512}	Slack demand	$p(S_{512})$	0,138	$c_{512}(t)$	-0,35
	V_{52} Re-launching production	i_{52}	5,5	S_{521}	Keen demand	$p(S_{521})$	0,400	$c_{521}(t)$	0,60
				S_{522}	Slack demand	$p(S_{522})$	0,600	$c_{522}(t)$	-0,45

The same thing can be said about the investments of each year symbolized i_{ki}, which corresponds to the analyzed decision points and to the estimated strategic options. Consequences c_{kij} can take positive or negative values, just like the states of nature from each opportunity point imply the use or the splitting up of the production capacities (the following basis for work were adopted – a keen demand for those levels which ensure a greater capacity use than the "barrier point"; in this case c_{kij} (t) >0, and a slack demand for a level which ensures a capacity use below the "barrier", in this case c_{kij} (t) <0).

The calculation of the probabilities of occurrence and manifestation of the states of nature implies, in its turn, two different methods: the simple probability method and the conditioned probability method. Simple probabilities can be determined either *objectively* (based on statistic information regarding the occurrence of repetitive phenomena) or *subjectively* (based on expertise) [7].

Conditioned probabilities are determined based on Bayes theorem which uses two types of probabilities: anticipatory (estimated before obtaining any information) and posterior (obtained after reviewing anticipatory probabilities based on information supplied by statistics).

Taking into consideration the importance attributed to an accurate evaluation of the occurrence probabilities of the states of nature in solving a complex decisional tree, we considered it necessary to gather and use additional information in order to eliminate all doubt.

The states of nature, symbolized by those arches which emerge from the opportunity-points of the tree in figure 1, generally show the modification of the demand on the market in relation to the analyzed strategic options. Thus, in the beginning there is an estimation of a set of antecedent probabilities – the option will register either a success or a fiasco – which are determined subjectively, based on information gathered from managers and specialists within UTILAJUL. With the help of a market research, it is possible to adopt a strategic decision based on both the initial information and on data gathered from substantial research of the demand [2]. Table 2 reveals both a priori probabilities and the probabilities resulted from marketing research forecasts for decision knots 2, 3 and 5 (the object of the market researches for the three cases is the high level of demand and the reduced level of demand, respectively).

The major strategic options emerging from the first decisional knot were the subject of a different research – considering the major changes included by each of them in the activity portfolio structure of UTILAJUL. The analysis of the market reaction (favorable or unfavorable) was modified according to the three different categories of portfolio – success, mediocre and failure. Antecedent probabilities, as well as probabilities resulted from researches are shown in table 2.

Table 2: Conditioned and transcendental/antecedent probabilities of the success or failure of the strategic options in relation to the levels of demand (decisional knot 2, 3 and 5)

Decisional knot	The states of nature	Antecedent probabilities	Forecasts of the market demand	
			Success	Failure
5	M – Keen demand	P(M) = 0,7	P(S/M) = 0,8	P(E/M) = 0,2
	m – Slack demand	P(m) = 0,3	P(S/m) = 0,3	P(E/m) = 0,7
3	M – Keen demand	P(M) = 0,8	P(S/M) = 0,5	P(E/M) = 0,5
	m – Slack demand	P(m) = 0,2	P(S/m) = 0,4	P(E/m) = 0,6
2	M – Keen demand	P(M) = 0,6	P(S/M) = 0,8	P(E/M) = 0,2
	m – Slack demand	P(m) = 0,4	P(S/m) = 0,4	P(E/m) = 0,6

Table 3: Conditioned and antecedent probabilities of the success portfolio, mediocre and failure portfolios in relation to the evolution of the market (decisional knot 1)

Decisional knot	The states of nature	Antecedent probabilities	Portfolio forecasts per activity		
			Success	Mediocre	Failure
1	F – Favorable attitude	P(F) = 0,40	P(S/F) = 0,60	P(M/F) = 0,20	P(P/F) = 0,20
	N – Unfavorable attitude	P(N) = 0,60	P(S/N) = 0,10	P(M/N) = 0,20	P(P/N)= 0,70

The following notations were used in the two tables:

P(M) - antecedent probabilities corresponding to the higher demand level;
P(m) - antecedent probabilities corresponding to the lowest demand level;
P(S/M) - the probability that the marketing research should indicate success, the demand being high, as a matter of fact;
P(S/m) - the probability that the marketing research should indicate success, the demand being low;
P(E/M) - the probability of failure estimated by researches when the demand reached high levels;
P(E/m) - the probability of failure estimated by researches when the demand reached low levels;
P(F) - antecedent probability corresponding to a favorable attitude of the market;
P(N) - antecedent probability corresponding to an unfavorable attitude of the market;
P(S/F) - the probability that the research should indicate success when the attitude of the market was favorable;
P(S/N) - the probability that the research should indicate success when the attitude of the market was unfavorable;
P(M/F) - the probability of the portfolio mediocrity (resulted from researches) when the

reaction of the market was in fact a favorable one;

P(M/N) - the probability of the forecasted mediocrity of the portfolio when the reaction of the market was unfavorable;

P(P/F) - the probability of forecasting a failure portfolio when the attitude of the market is favorable;

P(P/N) - the probability of the forecasted failure when the portfolio was in fact a fiasco;

The conditioned probabilities detailed above reflect, in fact, the reliability level or the safety degree which can be attributed to researches for the forecasting of the evolution of the enterprise. These probabilities which describe, in fact, the experience achieved during such market researches are based on the statistics of successes and failures, on the reports of companies with similar activities or, merely subjective appreciations [11]. Normally, it is assumed that the performance of past forecasts will be achieved in the future, as well.

With the help of the two sets of probabilities – antecedent and conditioned – we can determine, further on, based on the Bayesian analysis, the posterior (revised) probability for a strategic option in order to register success, since the market research predicted success (noted P(M/S) in the case of decisional knots 2, 3 and 5).

The Bayes theorem asserts that the posterior probability of a state of nature S_j in relation to the result R of the empiric research is given by the following formula:

$$P\left(S_j/R\right)=\frac{P\left(R/S_j\right)\cdot P\left(S_j\right)}{\sum_{j=1}^{m}P\left(R/S_j\right)\cdot P\left(S_j\right)} \qquad (4)$$

where: R – represents the forecasted research result (or the additional information), which in the case of the strategic decisional tree is either the success (S), or the fiasco (E) (for decisional knots 2, 3, 5); either the success (S), or the mediocrity (M), and the loss (P), respectively (for the first decisional knot);

S_j – the states of nature – keen demand (M) or slack demand (m), favorable (F) or unfavorable (N) reaction;

j = 1,2,….,m (the number of the states of nature – in our case j = 2 for each decisional knot).

Tables 4 and 5 present the result of the posterior probability calculation for the four decisional knots and its correspondence with the probabilities of the states of nature $p(S_{kij})$ from the decisional tree in figure 1 (we must note that the values of the revised probabilities are the ones comprised by table 1 which includes the parameters of the decisional tree).

Table 4: The values of the revised probabilities according to Bayes and their correspondence with the probabilities $p(S_{kij})$ (decisional knots 2, 3 and 5)

Decisional knots	The states of nature	Revised probabilities					
		Success	Correspond. with $p(S_{kij})$	Value	Failure	Correspond. with $p(S_{kij})$	Value
2	M – keen demand	P(M/S)	$p(S_{211})$	0,750	P(M/E)	$p(S_{221})$	0,333
	m – slack demand	P(m/S)	$p(S_{212})$	0,250	P(m/E)	$p(S_{222})$	0,667
3	M – keen demand	P(S/M)	$p(S_{311})$	0,833	P(M/E)	$p(S_{321})$	0,769

	m – slack demand	P(m/S)	$p(S_{312})$	0,167	P(m/E)	$p(S_{322})$	0,231
5	M – keen demand	P(M/S)	$p(S_{511})$	0,862	P(M/E)	$p(S_{521})$	0,400
	m – slack demand	P(m/S)	$p(S_{512})$	0,138	P(m/E)	$p(S_{522})$	0,600

Table 5: Revised Bayes probabilities and their correspondence with the probabilities $p(S_{kij})$ (decisional knot 1)

Decisional knot	The states of nature	Revised probabilities								
		Success portfolio	Corresp. with $p(S_{kij})$	Value	Mediocre portfolio	Corresp. with $p(S_{kij})$	Value	Failing portfolio	Corresp. with $p(S_{kij})$	Value
1	F – favorable attitude	P(F/S)	$p(S_{121})$	0,800	P(F/M)	$p(S_{111})$	0,400	P(F/P)	$p(S_{131})$	0,160
	N – un - favorable attitude	P(N/S)	$p(S_{122})$	0,200	P(N/M)	$p(S_{112})$	0,600	P(N/P)	$p(S_{132})$	0,840

Solving the strategic decisional tree implies, as we have mentioned previously, the „*roll-back*” procedure.

The analysis starts from the last decisional point:

- *Decisional point 5*. We must calculate the mathematic expectations of the two options V_{51} and V_{52} based:

$$E(V_{51}) = p(S_{511})\sum_{t=6}^{10}\frac{c_{511}(t)}{(1+d)^t} + p(S_{512})\sum_{t=6}^{10}\frac{c_{512}(t)}{(1+d)^t} - \frac{i_{51}}{(1+d)^5} = 0{,}152 \ (\$ \text{ million})$$

$$E(V_{52}) = p(S_{521})\sum_{t=6}^{10}\frac{c_{521}(t)}{(1+d)^t} + p(S_{522})\sum_{t=6}^{10}\frac{c_{522}(t)}{(1+d)^t} - \frac{i_{52}}{(1+d)^5} = -2{,}783 \ (\$ \text{ million})$$

The optimum solution for decisional point 5 is the one that meets the following condition: $max\{E(V_{51}); E(V_{52})\} = max\{0,152; -2,783\} = 0,152 \Rightarrow V_{opt}^{*} = V_{51}$ meaning „*Status – Quo*” represents the best option in decisional point 5.

- As far as *the decisional point 4* is concerned, it does not imply the need to make any calculations, because V_{41} (meaning the “*Status Quo*”) is the only available strategic alternative under that circumstance. However, the determination of the mathematic expectation $E(V_{41})$ is important for a correct evaluation of the alternatives from the first decisional knot.

$$E(V_{41}) = p(S_{141})\sum_{t=6}^{10}\frac{c_{141}(t)}{(1+d)^t} - \frac{i_{41}}{(1+d)^5} = 1{,}201 \ (\$ \text{ milion})$$

- *Decisional point 3*. The mathematic expectations of the two options V_{31} and V_{32} are calculated next:

$$E(V_{31})=p(S_{311})\sum_{t=5}^{10}\frac{c_{311}(t)}{(1+d)^t}+p(S_{312})\sum_{t=5}^{10}\frac{c_{312}(t)}{(1+d)^t}-\frac{i_{31}}{(1+d)^4}=5{,}931(\$\text{million})$$

$$E(V_{32})=p(S_{321})\sum_{t=5}^{10}\frac{c_{321}(t)}{(1+d)^t}+p(S_{322})\sum_{t=5}^{10}\frac{c_{322}(t)}{(1+d)^t}-\frac{i_{32}}{(1+d)^4}=1{,}586\ \ (\$\text{ million})$$

$\max\{S_m(V_{31}); S_m(V_{32})\} = 5{,}931 \Rightarrow V_{opt}^* = V_{31}$, meaning the "*quality improvement*", which is applied to both processes and products at UTILAJUL, is the best choice in decisional point 3;

- *Decisional point 2*. The mathematic expectations of the options V_{21} and V_{22} are:

$$E(V_{21})=p(S_{211})\sum_{t=3}^{10}\frac{c_{211}(t)}{(1+d)^t}+p(S_{212})\sum_{t=3}^{10}\frac{c_{212}(t)}{(1+d)^t}-\frac{i_{21}}{(1+d)^2}=0{,}773\ (\$\text{ million})$$

$$E(V_{22})=p(S_{221})\sum_{t=3}^{10}\frac{c_{221}(t)}{(1+d)^t}+p(S_{222})\sum_{t=3}^{10}\frac{c_{222}(t)}{(1+d)^t}-\frac{i_{22}}{(1+d)^2}=-0{,}288\ (\$\text{ million})$$

$\max\{S_m(V_{21}); S_m(V_{22})\} = \max\{0{,}773; -0{,}288\} = 0{,}773$ ($ milion) $\Rightarrow V_{opt}^* = V_{21}$;

- *Decisional point 1*. In this case, it is necessary to calculate three mathematic expectations corresponding to the three emergent strategic options: V_{11} – diversification; V_{12} – disinvestment; V_{13} – developing service and consulting activities. The calculus of the mathematic expectation in the initial decisional point must also take into consideration the mathematic expectations of the strategic alternatives which were selected in those decisional points:

$$E(V_{11})=p(S_{111})\sum_{t=1}^{10}\frac{c_{111}(t)}{(1+d)^t}+\left[E(V_{31})+p(S_{112})\sum_{t=1}^{3}\frac{c_{112}(t)}{(1+d)^t}-i_{11}\right]=6{,}990\ (\$\text{ million})$$

$$E(V_{12})=p(S_{112})\sum_{t=1}^{10}\frac{c_{121}(t)}{(1+d)^t}+\left[E(V_{21})+p(S_{122})\sum_{t=1}^{3}\frac{c_{112}(t)}{(1+d)^t}-i_{12}\right]=2{,}109\ (\$\text{ million})$$

$$E(V_{13})=\left[E(V_{41})+p(S_{131})\sum_{t=1}^{5}\frac{c_{131}(t)}{(1+d)^t}\right]+\left[E(V_{51})+p(S_{132})\sum_{t=1}^{5}\frac{c_{132}(t)}{(1+d)^t}-i_{13}\right]=0{,}982\ (\$\text{ million})$$

$\max\{E(V_{11}); E(V_{12}); E(V_{13})\} = 6{,}990$ ($ million) $\Rightarrow V_{opt}^* = V_{51}$

Thus, the best strategy corresponds to the following sequence of strategic decisions: (V_{11}^*, V_{31}^*), meaning that at this point it is recommended to apply the option of diversification through assimilation in the process of industrial and civil construction equipment production. After four years (2011), if the demand is slack, the strategic option V_{31}^* will be chosen; it implies the intervention of the company's specialists for the implementation of the total quality management, in order to reach the objective of consolidating the present market segments and expanding to new markets (external markets are preferred) by continuous improvement. By paying attention to the problems regarding quality, the managers will try to fight the eventual failures which might occur as a consequence of option V_{11}^*(we must not forget the fact that a quick implementation of the diversification is a strategic option which implies an inevitable degree of risk). On the contrary, if the demand is keen, the enterprise will develop on the strategic alternative coordinates which were started in the initial point.

This is, in fact, the most convenient trajectory of the evolution of the company, which could grant not only the overcome of a critical situation but also the substantial pulses of future performances. In this case, the use of option V_{11} in the initial decisional point implies the greatest share of net income which amounts to 6.99 million $, obtained in the 10 years of strategy. Besides, the mathematic expectation of the highest incomes can be interpreted as an argument to minimize the risk of restructuring production within considered enterprise using the strategic alternative.

BIBLIOGRAPHY

[1] Andreica M., Stoica M., Luban F., *Quantitative Methods in Management*, Economic Pb. House, Bucharest, 1998
[2] Balaure V. (coord.), *Marketing*, Uranus Pb. House, Bucharest, 2002
[3] Barabas I., Brânzan P., Someşan C., Modern *Methods in Management and Marketing*, Sincron Pb. House, Bucharest, 1997
[4] Băcanu B., *Strategic Management*, Teora Pb. House, Bucharest, 1997
[5] Demetrescu M. C., *Methods of Analysis in Marketing*, Teora Pb. House, Bucharest, 2000
[6] Dura C., *Strategic Management*, Universitas Pb. House, Petroşani, 2006
[7] Ionescu Gh., Cazan E., Negruță A., *Modeling and Optimizing Managerial Decisions*, Dacia Pb. House, Cluj-Napoca, 1999
[8] Stăncioiu I., Militaru Gh., *Management. Fundamental Elements*, Teora Pb. House, Bucharest, 1998