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Strategic Integration with MAP-CLUSTER Software System[1]

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Abstract: *This paper describes an application of multicriteria choice problems in structuring and analysis of economic clusters by MAP-CLUSTER software system. The system utilises a specially designed approach to solve analysis problems that deal with planning, structuring and prediction variants of horizontal network integration of small business enterprises.*

Keywords: *Multicriteria analysis, decision support system, balanced scorecard, investment preference, economic clustering.*

I. Introduction

Contemporary economic practice has shown that competitiveness is supported by combining the strong positions of successfully developing companies with the positions of companies that are less successful, but technologically related and willing to cooperate in adherence to cluster principles. According to [7], an economic cluster is a network of providers, manufacturers, infrastructure elements and scientific research organizations, integrated by forming an added value that ensures the growth of competitive power through a steady growth of each element's productivity.

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An Economic Cluster (EC) is a group of enterprises that are joined by stable economical, political and social relations, which are not defined by an organised membership. The strategic target purpose of EC is to increase the degree of using knowledge (information clusters) and to establish new networks of communication in the production of an aggregate of innovative products. The benefit from cluster organisation is the direct stimulation of the national economy competitiveness power development with an accent on regional development. The shortcomings are the strong dependency of a cluster organisation's effectiveness on stable national politics regarding public-private partnership and the rules set up to regulate the relationships between cluster organisations and state institutions [8].

This paper describes a feasible application of multicruteria choice problems in structuring and analysis of economic clusters by MAP-CLUSTER software system which is an extension developed as a decision-making support tool in economic clustering [6]. The system utilises a specially designed approach [5], to solve analysis problems that deal with planning, structuring and prediction variants of horizontal network integration of Small Business Enterprises (SBE) in a technological network chosen by the Decision Maker (DM). The final decision regarding the working variants of the EC is made based on two classical methods of multicriteria choice – LINCOM and MAXMIN [2]. The system allows the use of a modern approach to the management of integrated economical structures including Balanced SCorecard (BCS) based assessment [1]. Integration of these tools allows finding solutions while simultaneously taking into account the state of different resources (financial, material, non-material, etc.)

MAP-CLUSTER realizes the choice of a variant of integration as a multistage interactive procedure through a two-stage evaluation. Stage one evaluates the strategic positions, the financial, market and branch conditions of individual SBE-potential elements of EC according to thirty-two prime and eleven secondary parameters. Stage two assesses estimated target parameters of strategic budgets of variants of EC by BSC. An integrated index for the Investment Preference (IP) [4] is chosen as a criterion for the two-stage evaluation This index expands the structural decision making possibilities by acquiring ranking of EC variants, which is not only a financial performance indicators function, but also the function of indicators that encompass the diverse EC's environment [3].

The system allows the DM to experiment with different integration variants of EC with defined strategic development targets, to analyse the results and to make decisions through a multicriteria choice.

II. MAP-CLUSTER software system

The system includes stages, which are structured in three functional blocks (A, B, C), each one comprised of certain steps. Fig. 1 shows a basic diagram of the system.

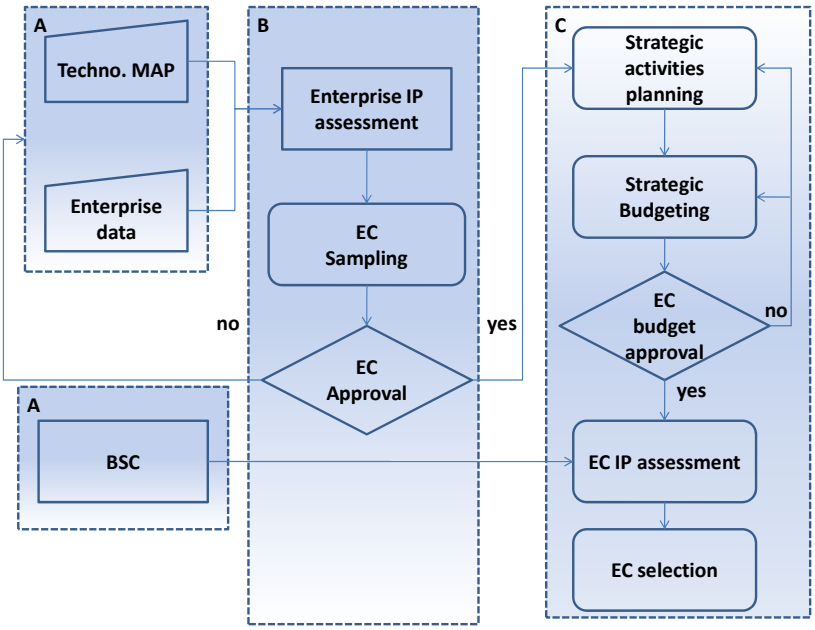

Fig. 1. MAP-CLUSTER functional scheme

Block A facilitates the input of data on SBE, calculating Investment Preference evaluation criteria and calculating the values on indices, part of the integrated BSC.

It is necessary, however, that the DM takes some preliminary steps. First, the DM should have worked out a preliminary vision for the structure of the Technological Map (TM) of the EC and second, to sample the list of potential SBE candidates for integration. The TM is a horizontal network structure that links providers, manufacturers, dealers, financial institutions, scientific groups and other potential participants in the design work, manufacture and realization of a product or service, targets of the structural integration. TM consists of junctions that define the activity of different enterprises (SBE) in the production of the chosen multitude of products/services. Each junction corresponds to a number of SBE (existing or potential).

The list of thirty-two prime parameters, integrated in the system, can be found on Fig. 2. The qualitative parameters are evaluated on a five-level grading scale. The quantitative parameter data is taken from the financial reports of SBE and from national statistical data.

The prime parameters evaluated by the DM are used to calculate eleven secondary parameters, the formulae to which are shown on Fig. 3. These eleven parameters are used for estimation of a complex-valued measure of investment preference IP_{SBEi} for each SBE.

Prime parameters c_i	*Value type*	*Prime parameters c_i*	*Value type*
Technology level Index c_1	qualitative	Annual training costs c_{16}	quantitative
Environmental Index c_2	qualitative	Average sector productivity c_{17}	quantitative
Investment policy Index c_3	qualitative	Average wage in industry c_{18}	quantitative
Strategic policy index c_4	qualitative	Scientific and technological institutions intercommunication c_{19}	qualitative
Financial resources provision c_5	qualitative	Level of technological development c_{20}	qualitative
Welfare expenditure c_6	qualitative	Internet procurement c_{21}	qualitative
Marketing policy c_7	qualitative	E-commerce c_{22}	qualitative
Database organization and management c_8	qualitative	Technological innovations c_{23}	quantitative
Training c_9	qualitative	ISO c_{24}	quantitative
Internationalization Index c_{10}	qualitative	Market researches c_{25}	qualitative
Index of financial stability c_{11}	qualitative	Main production market share c_{26}	quantitative
Commodity composition elasticity Index c_{12}	qualitative	Strategic flexibility c_{27}	qualitative
Annual expenditures c_{13}	qualitative	Range of products of commodities c_{28}	qualitative
Annual investment outlay c_{14}	quantitative	Average annual wage c_{30}	quantitative
Number of employees c_{15}	quantitative	Operating income c_{31}	quantitative
		Information security c_{32}	qualitative

Fig. 2. Prime parameters list

Secondary parameters	*Formula*
D_1 - Growing conditions Index (GCI)	$D_1 = \sum_{i=3}^{9} w_i c_i$
D_2 - Innovative activity Index (IAI)	$D_2 = c_{14} / c_{13}$
D_3 - Investments in human recourses (IHR)	$D_3 = \sum_{i=7}^{9} w_i D_i \; ; \; w > 0, \sum_{i=1}^{3} w_i = 1$
D_4 - Business - utilities (BU)	$D_4 = w_1 c_{21} + w_2 c_{22} + w_3 c_{32} \; ; \; w > 0, \sum_{i=1}^{3} w_i = 1$
D_5 - Technological and managerial innovation activity TMIA	$D_5 = (c_{23} + c_{24}) / c_{13}$
D_6 - Competitive activity (CA)	$D_6 = \sum_{i=25}^{28} w_i c_i$
D_7 - Trading costs Index (TCI)	$D_7 = c_{16} / c_{13}$
D_8 - Per person Annual average wage Index (PPAAWI)	$D_8 = c_{30} / c_{15} \times c_{18}$
D_9 - Per person productivity Index (PPPI)	$D_9 = c_{31} / c_{15} \times c_{17}$
D_{10} - Economic creativity (EC)	$D_{10} = \sum_{i=2}^{4} w_i D_i + \sum_{j=5}^{6} q_j D_j + a_6 C_{19} + a_7 C_{20}$
D_{11} - Growth trough competitiveness (GC)	$D_{11} = \sum_{i=1}^{2} w_i c_i + \sum_{i=10}^{12} q_i c_i + D_1$

Fig. 3. Secondary parameters list

The choice of SBE is made according to a ranking by IP_{SBEi} values, the calculation of which is presented later.

The third component of block A contains the BSC indices. This is a tool, by which a development strategy for the EC is formulated. The goals and indices of the system are determined by the defined strategic development themes and encompass four directions: finances, markets, internal business processes, knowledge and

development. The strategic themes indices included in MAP-CLUSTER are as follows:

Financial indices: Value of assets; Value of assets/number of employees; Revenue/Value of assets; Revenue/number of employees; Profit/value of assets; Profit/number of employees.

Markets: Number of regular clients; Number of regular suppliers; Market share; Client loyalty index; Supplier loyalty index; Reputation.

Internal business processes: Supply rhythm; Sales rhythm and time; Direct customer contacts (direct sales quota/indirect sales); Deficit of deliveries; Productivity growth; Nomenclature expansion.

Knowledge and development: Qualification expense/total expense; highly qualified specialists/all employees; scientific research expense/total expense; administration/all employees.

The structure of BSC is shown on Fig. 8. The BSC estimates are used in the third block of the system.

The second block (B) includes an estimate of IP_{SBEi}, forming and approving EC variants, for which the strategic planning session is continued.

The complex value IP_{SIG} is calculated by the following formulae:

$$IP_{SBE_i} = \left[\frac{D_{i10} - \min(D_{10})}{\Delta D_{10}}\right] \times \left[\frac{D_{i11} - \min(D_{11})}{\Delta D_{11}}\right],$$

$$\Delta D_{10} = [\max(D_{10}) - \min(D_{10})]/5,$$

$$\Delta D_{11} = [\max(D_{11}) - \min(D_{11})]/5,$$

where:

i is an indicator of SBE,

D_{10} is the Index of *economic creativity*

$$D_{10} = w_1\left(\frac{c_{14}}{c_{13}}\right) + w_2\left(\frac{\frac{c_{16}}{c_{13}} + \frac{c_{30}}{c_{15}c_{18}} + \frac{c_{31}}{c_{15}c_{17}}}{3}\right) + w_3c_{19} + w_4c_{20} +$$

$$+ w_5\left(\frac{c_{21} + c_{22} + c_{32}}{3}\right) + w_6\left(\frac{c_{23} + c_{24}}{c_{13}}\right) + w_7\left(\frac{c_{25} + c_{26} + c_{27} + c_{28}}{4}\right),$$

$$w_1 = w_2 = \ldots = w_7;$$

D_{11} is the Index of growth through *competitive power*

$$D_{11} = \sum_{i=1}^{12} w_i c_i,\ w_1 = w_2 = \ldots = w_{12}.$$

The value of $IP_{SBEi} \in [0, 25]$. This estimate characterizes the order of individual SBE. It is meant to help the DM in his choice whether or not to include a particular SBE in a variant of an EC. The DM alone chooses the boundary value of IP_{SBEi}, which will serve him as an EC inclusion criteria. The number of variants formed depends on the DM. The system only allows the inclusion of input SBE in

an EC. If the DM deems the values of the IP_{SBEi} estimate for one or more SBE of a certain technological group as unsatisfactory, they can form a new EC variant with an incomplete technological network, but it must be noted during the following prognostic stages, that the missing activity in the technological group is to be compensated for either by outsourcing or by setting up a new group. The alternative EC structure variants can be as follows:

First. The TM has empty groups and they shall be serviced by means of outsourcing.

Second. The TM has empty groups and they shall be filled by newly created elements of the grouping (investments). During the prognostic period the activity shall be taken over by an element external to the network.

Third. All TM groups are full.

Fourth. The TM has empty groups and they shall be filled by remediation of elements (investments) that have been rejected during initial analysis.

The process is depicted in a diagram on Fig. 4. A TM has been entered in block (A) comprised of *n* groups and SBE with identifiers corresponding respectively to the belonging to the technological groups of the network and to the consecutive number (1,1; 1,2; ... , 1,*n*; 2,1; 2,2; ..., 2,*n*; *n*,1; ...; *n*,*n*). IP_{SBEi} have been calculated in block B. The DM defines, for example, three variants of an EC that contain four groups. According to the boundary value of IP_{SBEi}, only one of the three variants (variant 3) has a full TM; variant 1 has an unfilled group 3, variant 2 has an unfilled group 4. With these variants, the DM continues the planning procedure in block C.

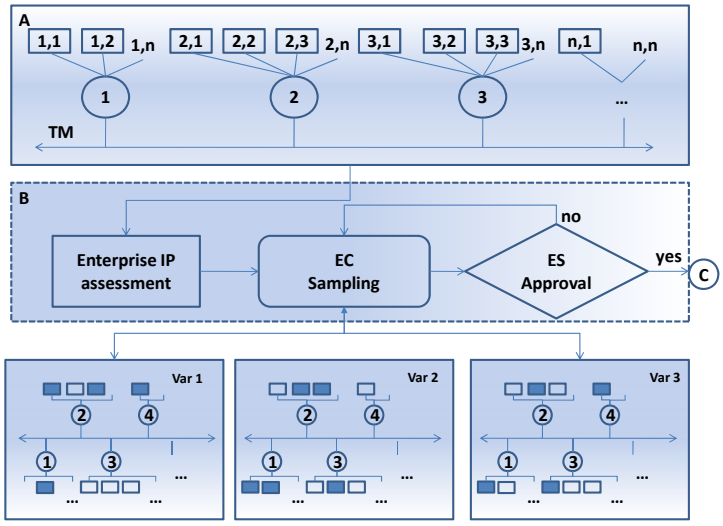

Fig. 4. Stage B functional scheme

Block C is where the strategic budget planning procedures for all EC variants are carried out and where the final ranking is obtained. Strategic budgets estimation includes: expert assessment of an EC activity programme by period; estimating labour expenses; asset expenses; material and other expenses; estimating realisation

income and income in the profit centre of the EC; generating a consolidated budget; calculating the BSC indices and producing an arrangement of the EC variants.

In order to form the resource expenses, the following four groups are consecutively and expertly estimated:

First group. Labour expenses for the period of planning the respective qualification groups (in kind and value), the breakdown (expertly assigned) by activity and by period. The annual labour expenses are estimated for the whole period with a change of their breakdown by activity. The qualification categories cannot be changed.

Second group. Expenses for material and non-material assets for the period of planning (in kind and value). Asset expenses are included as depreciation allowances. The breakdowns of depreciation allowances by activity are expertly assigned.

Third group. Material expenses (in kind and value), the breakdowns of these expenses by activity and period.

Fourth group. Other expenses for the planning period by type (in kind and value), the breakdowns of these expenses first by activity and then by period. When estimating the strategic budget the other expenses are not classified by item, but are expertly assigned as a total amount for the prognostic period.

The revenue of the EC is estimated for the chosen profit making centre. The revenue is formed by the income from the volume of realized production, the income from expanding the list of products, the income from international and national programmes, the income from target financing, the income from new clients (expanding the market share), loan funds (service interest is shown as "financial expenses" in the budget) and others. The value of the income and its breakdown by time can be expertly assigned.

A diagram of how revenues and expenses are formed and their breakdown by periods, quota and activities can be found in Fig. 5.

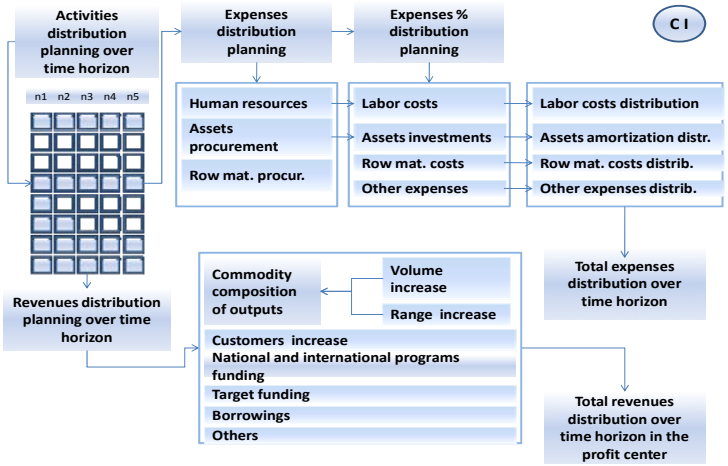

Fig. 5. Expenses and revenues planning scheme

The software system automatically generates consolidated budgets for all EC variants. The financial expenses are expertly estimated. The diagram of calculating and approving the consolidated budget can be found in Fig. 6.

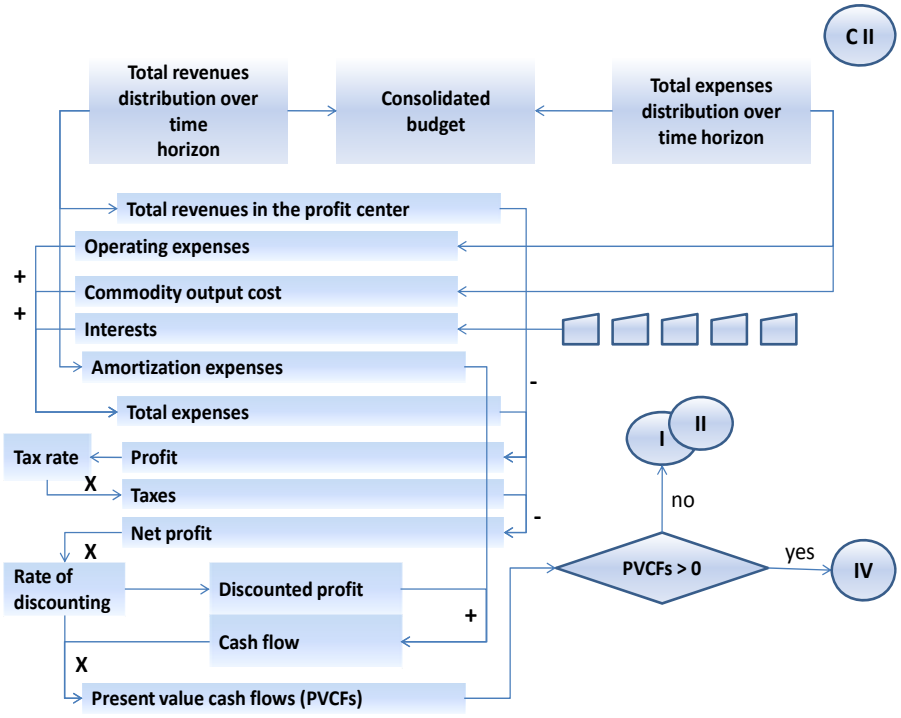

Fig. 6. EC consolidated budget approval

The development, analysis and approval of the budget is a multistage interactive procedure that allows the comparison between the effects of the activity of the cluster and the resource necessities. During the process of analysis the following conditions must be observed:

First condition. The present value of cash flows PVCF > 0. The budget is considered acceptable and takes part in the procedure of choosing an EC variant.

Second condition. PVCF < 0. The estimation procedure returns to either the stage of revising the planned activities by period or the stage of estimating the costs. The iterations repeat until PVCF > 0.

The consolidated budgets of the EC variants are evaluated by the integrated BSC system. The choice of indices in the system has been made at an initial stage of the development of MAP-CLUSTER and is described in [9]. The BSC diagram is shown in Fig. 8.

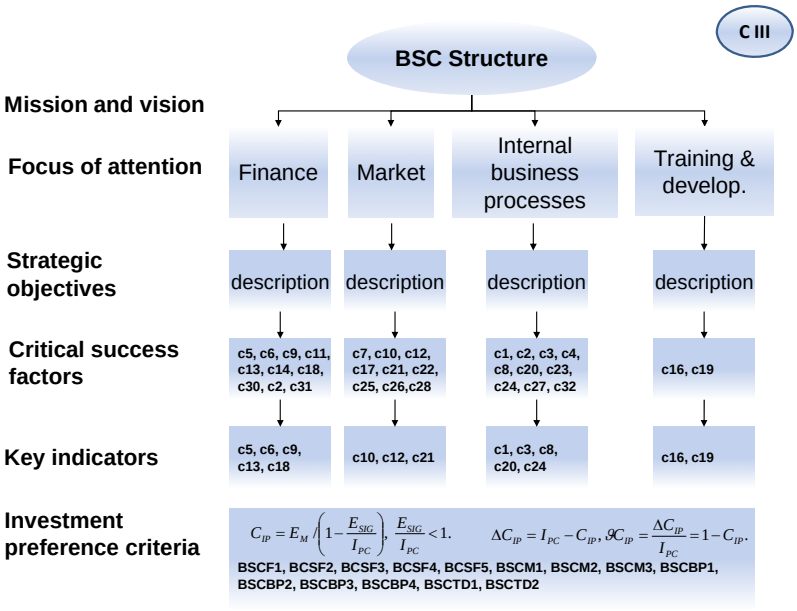

Fig. 7. Strategic budget BSC validation

A critical point of investment preference (C_{IP}) is calculated for the consolidated strategic budgets. It is an indicator of the cross point between the changes in the cumulative expenses for the activity of the EC and the changes in the income of the activity generated by these expenses. It is calculated by the following formula:

$$C_{IP} = \frac{E_M}{\left(1 - \frac{E_{SIG}}{I_{PC}}\right)}, \frac{E_{SIG}}{I_{PC}} < 1,$$

where:

E_M is the production expenses by cost;

E_{SIG} is the expenses for building the cluster;

I_{PC} is the income of realisation in the profit centre.

The criteria for evaluating the quality of the budget are: the deviation from C_{IP} (ΔC_{IP}) and θC_{IP}, where:

$$\Delta C_{IP} = I_{PC} - C_{IP}, \vartheta C_{IP} = \frac{\Delta C_{IP}}{I_{PC}}.$$

The remaining criteria for evaluation and the method of calculation are shown in Fig. 8.

BSC Investment preference criteria
Financial strategic objectives
$BSCF_1$ = Profit/ total number of employees
$BSCF_2$ = Net profit / total expenses
$BSCF_3$ = Net profit / total number of employees
$BSCF_4 = \theta C_{iP}$
$BSCF_5$ = Net present value / SIG construction expenses
Market strategic objectives
$BSCM_1$ = Revenues of total of outputs/ total revenues
$BSCM_2$ = Revenues of Range of products commodities / total revenues
$BSCM_3$ = Revenues of new customers / total revenues
Internal business processes objectives
$BSCIBP_1$ = License and patent purchase / total expenses
$BSCIBP_2$ = SIG construction expenses / total expenses
$BSCIBP_3$ = Information system development / assets expenses
$BSCIBP_4$ = Total Management expenses / assets expenses
Training and development strategic objectives
$BSCTD_1$ = Number of highly qualified specialists/ total number of employees
$BSCTD_2$ = Investments in human recourses/ total expenses

Fig. 8. BSC investment preference criteria

To get a final ranking of the EC variants, the DM inputs a weight ratio for all criteria included in the BSC. The sum total of the weight ratios must equal 1. The system uses two methods of multicriteria choice – LINCOM and MAXIMIN (Fig. 9).

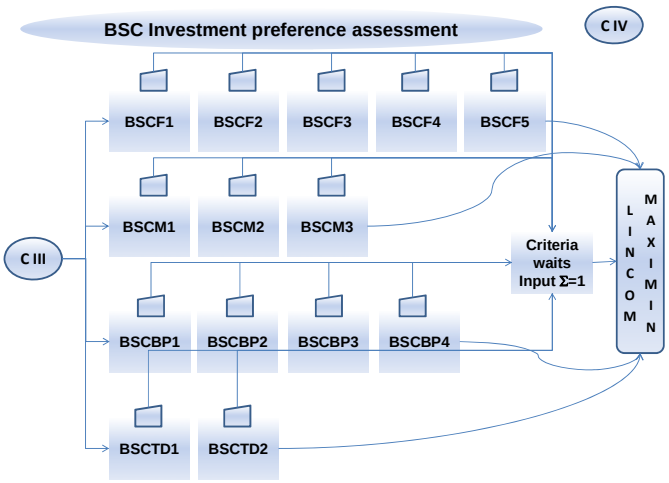

Fig. 9. BSC criteria weights input

III. Investment preference assessment problem

Let us view the following problem: choose an EC variant with a horizontal technological network, comprised of five groups: centre, supplier, trader, manufacturer, other. Analyze 12 SBE. Form at least two EC variants.

For shortness of presentation, the expert assessment of prime and secondary criteria are not presented here. The order of SBE by IP_{SBEi} values is presented in Fig. 10.

Technology map unit	Enterprise ID	IP_{SBE} value
Center		
	SBE_{12}	25.0
	SBE_{1}	0.2
	SBE_{2}	0.1
Supplier		
	SBE_{4}	0.2
	SBE_{3}	0.1
Trader		
	SBE_{10}	4.4
	SBE_{11}	0.5
Manufacturer		
	SBE_{9}	9.2
	SBE_{8}	1.1
	SBE_{5}	0.1
	SBE_{6}	0.1
Other		
	SBE_{4}	5.4

Fig. 10. IP_{SIG} values

The results do not allow forming an EC with a complete TM. Based on the evaluations, three variants are formed on equal incomplete TM: Centre, Manufacturer, and Trader. The variants are shown in Fig. 11.

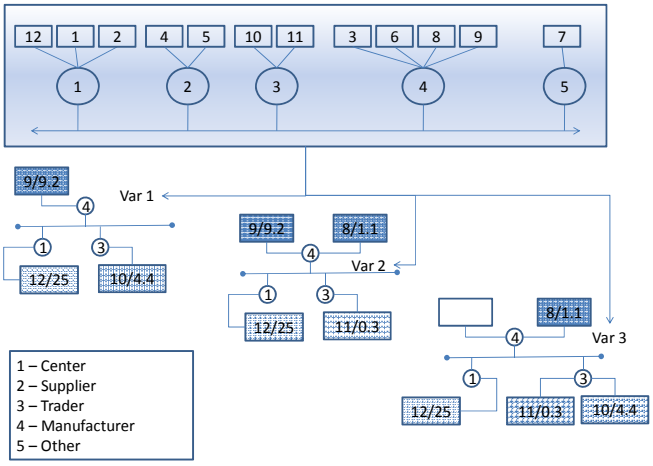

Fig. 11. EC Sampling

The DM plans a breakdown of activities by periods (Fig. 12). The filled squares show that expenses are planned for the particular activity and period. The unfilled squares indicate a lack of planned expenses for these activities and periods.

The unplanned activities for the respected periods remain inaccessible, which helps avoid a lot of mistakes in inputting the data in the next expenses estimation.

Variants 1 and 2 have the same breakdown. The activities management and supplies, investment in human recourses and advertising are constant for the whole prognostic period. License and patent purchase are planned in the first prognostic period. Information system development is planned for the first two periods.

For variant 3, in addition to constant activity on management, supplies and advertising, activities on outsourcing are also planned for the first two periods. License and patent purchase is planned for the third period. Information system development and investment in human recourses are planned for the second and third period.

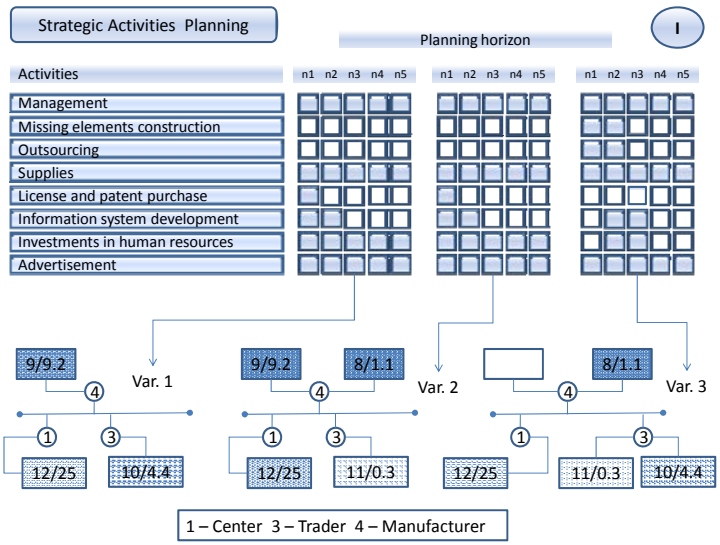

Fig. 12. Strategic activities planning

By choice of the DM, the planned labour expenses, which include staff divided into seven qualification groups, the expenses in man/days, the daily tariff rate and the total calculation are equal for the three EC variants. The breakdown of these expenses by activities and periods for variant 3 is different, because of differences in the strategic activities plan (Fig. 13).

Labor costs	**Var. 1, Var.2, Var. 3**			
Qualification groups of human resources	N	working day	Wage rate/per day	Total
1. Highly qualified manager	4	1250	100	500000
2. Average qualified manager	5	1250	80	500000
3. Manager	2	1250	55	137500
4. Highly qualified IT specialist	3	1000	90	270000
5.Operator	3	1325	45	1788875
6. Administration staff	2	1325	40	106000
7. Support staff	4	1325	30	159000

Fig. 13. Breakdown of labour expenses

The breakdown of labour expense values is generated automatically (Fig. 14).

Labor costs percent distribution	Var.1, Var. 2						Var. 3					
Activities		Periods						Periods				
	By act.	1	2	3	4	5	By act.	1	2	3	4	5
Management	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Outsourcing							0.20	0.5	0.5			
External services							0.05	0.5	0.5			
Supplies	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2
License and patent purchase	0.1	0.1					0.05			0.1		
Information system development	0.3	0.5	0.5				0.2		0.5	0.5		
Investments in human recourses	0.2	0.2	0.2	0.2	0.2	0.2	0.1			0.3	0.3	0.4
Advertising	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2

Labor costs distribution	Var.1, Var. 2					Var. 3				
Activities	Periods					Periods				
	1	2	3	4	5	1	2	3	4	5
Management	74055	74055	74055	74055	74055	74055	74055	74055	74055	74055
Outsourcing						185070	185070			
External services						46268	46268			
Supplies	87028	87028	87028	87028	87028	37014	37014	37014	37014	37014
License and patent purchase	185138							92535		
Information system development	277708	277708					185070	185070		
Investments in human recourses	74055	74055	74055	74055	74055			55521	55521	74028
Advertising	37028	37028	37028	37028	37028	37014	37014	37014	37014	37014
Total	1850700					1850700				

Fig. 14. Labour expenses distribution

Likewise, the data for raw material, material and other expenses are input. After inputting the list of products and estimated purchasing prices, the DM fills in the breakdown of these expenses by activity and period. In the example this data is equal for the three EC variants and have not been shown for shortness of this presentation.

In order to calculate the asset expenses, the chosen depreciation norms are input in per cent by depreciation period. The purchase of assets of different value and time are planned for the three variants which affects the breakdown by activity and period. The general statement is shown in Fig. 15.

Assets amortization distribution	Var.1					Var. 2					Var. 3				
Activities	Periods					Periods					Periods				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Management	35000	35000	35000	35000		24000	24000	24000	24000	24000	20000	20000	20000	40000	40000
Outsourcing											30000	20000			
External services											20000	20000			
Supplies	87500	52500	70000	70000		6000	36000	48000	48000	48000	20000	20000	20000	20000	30000
License and patent purchase	78750					54000							20000		
Information system development	35000	35000				24000	24000					10000	20000		
Investments in human recourses	8750	43750	43750	43750		6000	30000	30000	30000	30000			10000	30000	20000
Advertising	8750	8750	8750			60000	60000	18000	18000	18000	10000	10000	10000	10000	10000
Total	700000					60000					50000				

Fig. 15. Assets amortization distribution

All of the estimated expenses for labour, assets, raw materials and materials and other expenses are combined in a general breakdown of expenses by activity

and period. For comparison the total estimated expenses for the three EC variants are presented in Fig. 16.

The revenue of the EC is estimated for the chosen profit making centre. The revenue is formed by the income from the volume of realized production, the income from expanding the list of products, the income from international and national programmes, the income from target financing, the income from new clients (expanding the market share), loan funds (service interest is shown as “financial expenses” in the budget) and others. The value of income and its breakdown by time can be expertly assigned. The generalised data on the planned revenue for the three EC variants is presented in Fig. 16. The values for each position of revenues and expenses in Fig. 16 are shown with accrual for the whole prognostic period. This is true for all following statements.

Total expenses	Var. 1	Var. 2	Var. 3
Activities			
Management	905275	890000	705140
Outsourcing			1392640
External services			1105036
Supplies	116390	1153500	682570
License and patent purchase	1038888	1016500	892535
Information system development	1405412	1390500	597640
Investments in human recourses	1290275	1281000	442570
Advertising	645140	643500	432570
Total	6451380	6375000	6250701

Total revenues	Var. 1	Var. 2	Var. 3
Volume of output increase	89500000	183500000	127100000
Range of products commodities increase	15000000	7000000	15000000
Customers increase	430000	840000	420000
National and international programs funding	100000	100000	100000
Target funding	0	0	0
Borrowings	250000	250000	250000
Others	0	0	0
Total	99280000	191690000	136870000

Fig. 16. Total expenses for EC variants

The consolidated budget is prepared for each EC variant. The diagram for calculating the consolidated budget is shown in Fig. 8. With the so planned revenues and expenses, the present value of cash flows is positive for all periods of planning. This makes the planned strategic budgets acceptable. The results for the consolidated budgets are shown in Fig. 17.

Consolidated budget	Var. 1	Var. 2	Var. 3
Profit center total revenues	99280000	191690000	136870000
Operating expenses	6451380	6375000	6250701
Commodity output cost	20750000	45750000	25550000
Interest expenses	50000	50000	50000
Amortizations	700000	600000	500000
Total expenses	27951380	52725000	32300700
Profit	71328620	138965000	104569300
Net profit	7232863	13896500	10456930
Taxes	64195750	125068500	94112370
Rate of discounting	6%	6%	6%
Discounted profit	110864500	218896300	157767400
Cash flows	64895750	125668500	94612370
Present value of cash flows	59202140	117175100	82477430

Fig. 17. Consolidated budgets for EC variants

The calculated values of BSC criteria are shown in Fig. 18.

Investment preference criteria values	Var. 1	Var. 2	Var. 3	Criteria waits
Financial strategic objectives				
$BSCF_1$	8334348	4316522	5950870	0.3
$BSCF_2$	2.3721	2.2967	2.9136	0.015
$BSCF_3$	5437761	2791120	4091842	0.015
$BSCF_4$	0.2469	0.2235	0.1956	0.015
$BSCF_5$	19.7127	10.0592	15.1363	0.015
Market strategic objectives				
$BSCM_1$	0.9573	0.9015	0.9286	0.15
$BSCM_2$	0.0365	0.1511	0.1096	0.15
$BSCM_3$	0.0044	0.0043	0.0031	0.1
Internal business processes strategic objectives				
$BSCIBP_1$	0.0193	0.0372	0.0276	0.01
$BSCIBP_2$	0.1209	0.2308	0.1935	0.01
$BSCIBP_3$	2.3175	2.0077	1.1953	0.01
$BSCIBP_4$	1.4833	1.2982	1.4103	0.015
Training and development strategic objectives				
$BSCTD_1$	0.1739	0.1789	0.1739	0.01
$BSCTD_2$	0.0243	0.04612	0.0137	0.185

Fig. 18. IP criteria values

After inputting weight ratios for each criterion, the final ranking of the EC variants can be seen in Fig. 19.

EC Variant	Comment	Assessment
LICOM		
Var. 1	Completed TM	0.820
Var. 2	Completed TM	0.789
Var. 3	Uncompleted TM	0.686
MAXIMIN		
Var. 1	Completed TM	0.363
Var. 3	Uncompleted TM	0.242
Var. 2	Completed TM	0.205

Fig. 19. EC variants ranking

The final result shows: according to the two methods the most preferable EC variant is the first one. With the weights of the criteria distributed this way by the DM, he/she shows main preference towards financial performance and more specifically – towards the index $BSCF_1$, that calculates the accumulated profit per number of employees. As a whole this variant has the most compact structure. The second and third variants switch places in the second order due to the fact that the minimum guaranteed result, the main index of which is $BSCF_4$, has the lowest value in variant 3. This variant also foresees outsourcing because the DM defines the TM as incomplete.

IV. Conclusion

The proposed approach of multicriteria evaluation of IP of the EC according to BSC allows the assessment of the quality of functioning of an integrated system while taking into account different aspects of its activity like structure, planning and management. The decision is made through an interactive problem of multicriteria choice. Due to the fact that some of the parameters are unspecified and they are often determined by expert procedures, seeking solution through algorithms of multicriteria choice provides an objective decision with the accuracy necessary for applied problems. The approach allows the integrated system of balanced scorecard to ensure balance between short-term and long-term goals, financial and non-financial indicators, internal and external factors of the activity.

Contemporary tendencies of restructuring the economy in times of financial crisis and the actuality of problems in the integral grouping of small and medium enterprises with the purpose of lessening the negative effects and providing conditions for growth, demand the development of adequate and adaptive tools to aid the process of decision making. For future development of the proposed approach and the MAP-CLUSTER system we can point out the use of other methods of multicriteria evaluation and optimization as well.

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