

INTEGRATED METHOD FOR EVALUATION OF INTANGIBLE ASSETS APPLIED TO RESEARCH SMES FROM NONCONVENTIONAL FIELD

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ABSTRACT: The paper deals with an integrated method for evaluation of intangible assets applied to Small and Medium Enterprises (SMEs) activating in research, through which they aim at obtaining sustainable competitive advantage (SCA). The intangible assets are strictly connected to competencies, which if are distinctive relative to competitors, represent a major option to SCA achieving. The elaborated method based on Producer Matrix needed to evaluate intangible assets in connection with competencies is integrated with products evaluation, based on Customer Matrix, and also with decision method based on Risk Cube. Another evaluation method with qualitative-quantitative character was described based on best practices leading to SCA achieving.

KEY WORDS: Intangible assets, research, small and medium enterprises, nonconventional technologies.

1. INTRODUCTION

Sustainable competitive advantage (SCA), mature concept studied by many personalities in the field, some of them improving it recently, is the basis for major economic performances for any enterprise [1, 2, 3, 4, 5], regardless of the field in which it activates, but it becomes essential in high-tech areas like nonconventional technologies. Research and consequently innovation is the main source of SCA, according to Joseph Schumpeter [6]. Technical innovation is a compulsory approach for enterprises activating in the field of the paper, but this cannot be achieved without owning specific intangible assets (IA) and connected competencies.

The process of SCA achieving based on IA is synthesized in fig. 1. The importance of intangible resources, integrated successively by capabilities and distinctive competencies - with the same intangible nature - at SCA obtaining, is also explained by their connection to the parameters for evaluating the probability to obtain SCA: D_c - distance of organization against its main competitors (based on Customer Matrix); D_p - duplication difficulty of SCA; St - sustaining over time of SCA (D_p and St based on Producer Matrix) [7, 8].

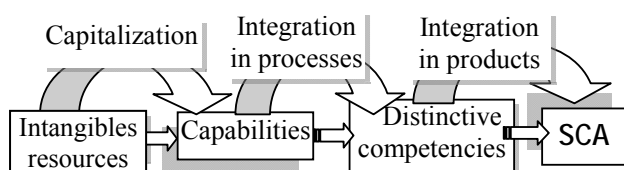


Figure 1. Model of SCA obtaining based on intangible resources

Many evaluation methods of IA were elaborated like [9, 10]. The tool created in the frame of EVLIA project [11] has a high degree of complexity with holistic character, requiring relative high time consuming for using. This is justified by the intention to get access on this basis, of SMEs to financial resources of different financial actors types. Since SMEs have usually low level of corporate actives, it is difficult to get financial loans, but this trend is about to change on USA financial markets and progressively in Europe. Here, the problem is not having enough methods to evaluate intangible assets, but to apply them to solve this important economic bottleneck. The main evaluation method for IA, proposed in this paper is differentiated from similar ones through its integration with internal and external analysis, aided by a proactive approach by coupling it with a decision maker method, based on risk minimization.

2. EVALUATIONS AND STRATEGIES IN THE FRAME OF PRODUCER MATRIX

This variant of intangible assets evaluation of an enterprise is conceived in strong connection with its organizational competencies, based on Producer Matrix (PM), which is a method of internal analysis.

The producer matrix involves two variables: the effectiveness and the cost per unit [12], presented in fig. 2. Hence, the producer matrix establishes the relation between the relative cost per unit and relative competencies of the organization. The position of an organization O is determined by relative coordinates through comparison with main competitors on the market segment.

The main displacements in Producer Matrix are also relative, i.e. a movement in the direction of *W*, by reducing unit cost, could be transformed to a movement toward *E* if the competitors competencies are superior to those of organization *O*. Similarly, the displacement toward *S* is in the same relation to the *N* one.

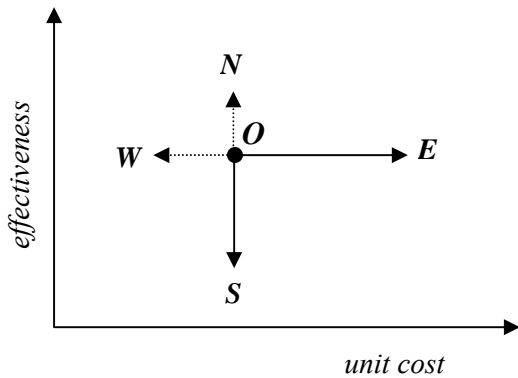


Figure 2. Producer matrix variables and its basic movements

The integrative character of this evaluation method resides from the correlation of the mentioned above variables with other two that have external exposure and are related to product characteristics. These are Perceived Used Value and Perceived Price, and are specific to Customer Matrix (CM), this relationship being presented in fig. 3. The competitors (*O*, *A*, *B*, *C*) aim at their positions improvement by raising their corresponding competencies through NW movement in Producer Matrix, and consequently in Customer Matrix by moving the corresponding products in the same direction.

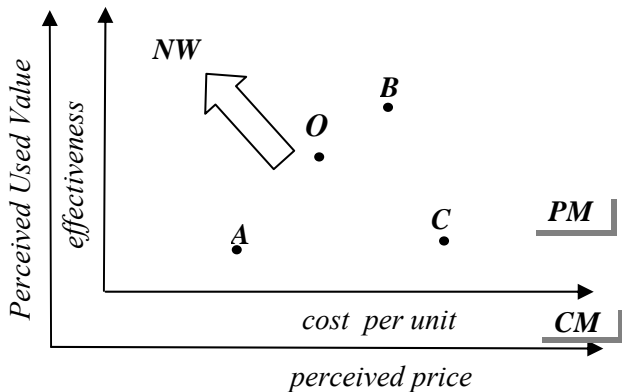


Figure 3. Correlation between variables of Producer and Customer Matrix at integrated method of evaluation

Competencies from vertical axis are called effectiveness competencies, aiming at fulfillment of strategic objectives related to perceived use value increase of organization products.

Competencies from horizontal axis are called focused cost competencies that become of utmost importance nowadays, under conditions of global economic crisis. But cost reducing in the context mentioned above is not sufficient without quality assurance, the customers buying products at high

quality at relative low prices. The products costs can be decreased through nonconformities reduction, but quality supposes specific costs that cannot be avoided, representing at least 30% from a product cost [14]. So, as it is expected, there is correlation between competencies from vertical and horizontal axes, explained by the systemic character of organizational issues, reflected also by a fundamental principle from ISO 9000 standard, *System approach to management*.

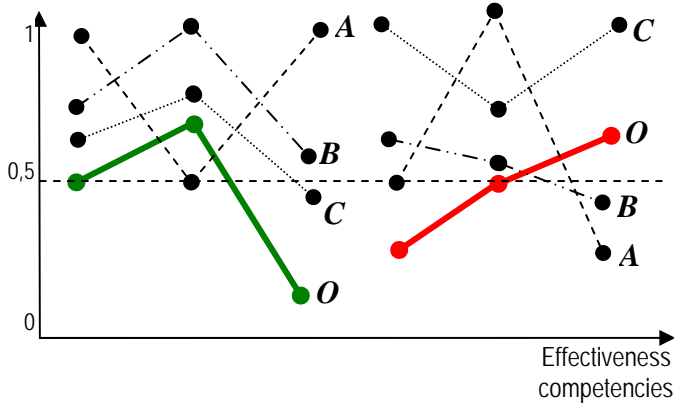
There is an indirect connection between Customer Matrix and Producer Matrix. The competitive advantage can be obtained only as a result of movement within Customer Matrix, through growing vectors, whose resultant has the ideal direction toward NW (fig. 3).

The paradox of this interdependence between the two discussed matrixes is that the organization can only actuate on the variables of Producer Matrix, on the corresponding directions - both of them being ways to obtain SCA [1]: decreasing the costs per unit, aiming at increasing of efficiency, and also to support price reduction; increasing of essence competencies in order to support PUV.

3. EVALUATIONS OF INTANGIBLE ASSETS CONNECTED TO COMPETENCIES

The method was applied in case of a Romanian research medium enterprise (*O*) that has long experience in Electrical Discharge Machining (EDM), but under actual economic crisis and subfinancing of national research system has lost significant competencies during past years, especially by human resources decrease. The organization *O* wants to know which is the required level of competencies related to IA to obtain SCA, in the area of machines for microEDM.

The required level of competencies results from the relative position against the main competitors from Germany (*A*), Great Britain (*B*), and Switzerland (*C*). The relative profiles of effectiveness competencies for the medium enterprise *O* and its competitors are presented in fig. 4. Decisive competencies of *O* that have higher weights in competitive profile should be positioned in the upper part on the relative scale 0-1. Thus, the operating competencies, more specific Technology competencies with 50% weight should be over 0.5; Supply and Marketing competencies (weight 10%) should be at much higher level, closer to relative level of 0.5. Concerning system competencies, those regarding Innovation whose weight is 25% and respectively, Quality Assurance with weight of 20% should be situated much over relative level of 0.5.

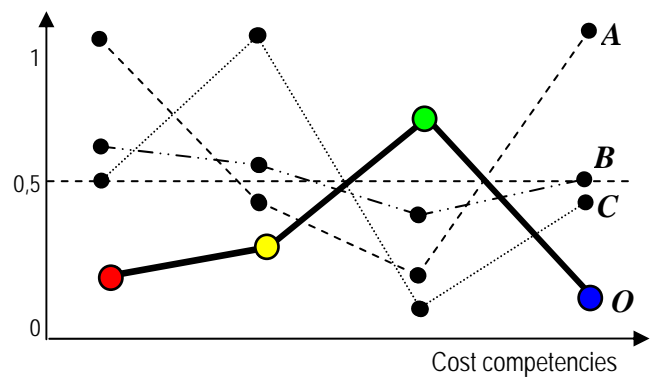


| Technology | Supply | Marketing | Innovation | Quality Assurance | Value Increase |
|------------------------|--------|-----------|---------------------|-------------------|----------------|
| 30% | 10% | 10% | 25% | 20% | 5% |
| Operating competencies | | | System competencies | | |

Figure 4. Competitors profiles of effectiveness competencies

The weights assigned to operating and system competencies are appropriate to such an advanced technologic field like nonconventional one, where innovation is strongly related to technology that must be highly dynamic to keep the development rhythm of this sector that is generally in the launching-development stage of its life cycle. Supplying with quality components at low prices is of utmost importance, at the same level with marketing competence, under the actual economic crisis, aiming at a final product with relative low cost and accessible price. Quality assurance and an appropriate quality system that covers efficiently all organizational processes have high impact on all other competencies in any field, and therefore in the approached one that provides products responding to such high customer requirements. Value increased competencies addresses only limited improvement of products, with low level of innovation and small impact on product performances, therefore its corresponding weight is ranked low.

The competitors profile relative competencies focused on unit cost decrease are presented in fig. 5. Regarding the competencies of *O* focused on costs decrease, Coordination and Control as well as Continuous Cost Decrease with highest weights, of 50% and respectively 30% should be greater than 0.5 relative level. The first are the competencies that make difference between competitors since the complexity of products and technologies of organization progressively grows as is the case of nonconventional field. The second one is influenced by the natural trend to costs growing as the complexity of processes deployed by organization continuously increase. So, this item must be kept under control. This is the case of approached field in this paper. These are the main reasons for relative high weights assigned to these competencies.



| Coordination and Control | Continuous Cost Decrease | Production Factor Costs | Economy of Scale |
|--------------------------|--------------------------|-------------------------|------------------|
| 50% | 30% | 15% | 5% |

Figure 5. Competitors profiles of costs focused competencies

The relative level of Production Factor Costs is situated at over 0.5 level, common characteristic of a Romanian organization in comparison with other European countries that have access to such educated human resources in the nonconventional technology field. Economy of Scale is not specific to a sector situated in the launching-development phase, justifying such low assigned weight. Moreover a SME, which is the case of analyzed organization *O*, has not the capacity to assure high volume of fabrication.

A first aggregate mark of operational and system competencies, (N_{os}) was determined using the following relation and the data from fig. 4:

$$N_{os} = \sum w_i C_{osi} \quad (1)$$

$= 30\%TC + 10\%SC + 10\%Mk + 25\%IC + 20\%QA + 5\%VI = 0,44$
 where: w_i is the weight assigned to a certain operational or system competency [%]; C_{osi} – level of corresponding competency on the scale 0-1; TC, SC, Mk, IC, QA, VI are the levels on scale 0-1 for respective competencies: Technology, Supplying, Marketing, Innovation, Quality Assurance, Value Increasing.

A second aggregate mark of competencies focused on costs, (N_{fc}) was determined using the following relation and the data from fig. 5:

$$N_{fc} = \sum w_i C_{fci} \quad (2)$$

$= 50\%CC + 30\%CCD + 15\%PFC + 5\%ES = 0.31$
 where: w_i is the weight assigned to a certain costs focused competency [%]; C_{fci} – level of corresponding competency on the scale 0-1; CC, CCD, PFC, ES are the levels on scale 0-1 for respective competencies: Coordination and Control, Continuous Cost Decrease, Production Factor Costs, Economy of Scale.

Same procedure was applied to main competitors (A, B, C) aiming at getting their corresponding positions in Producer Matrix from fig. 6.

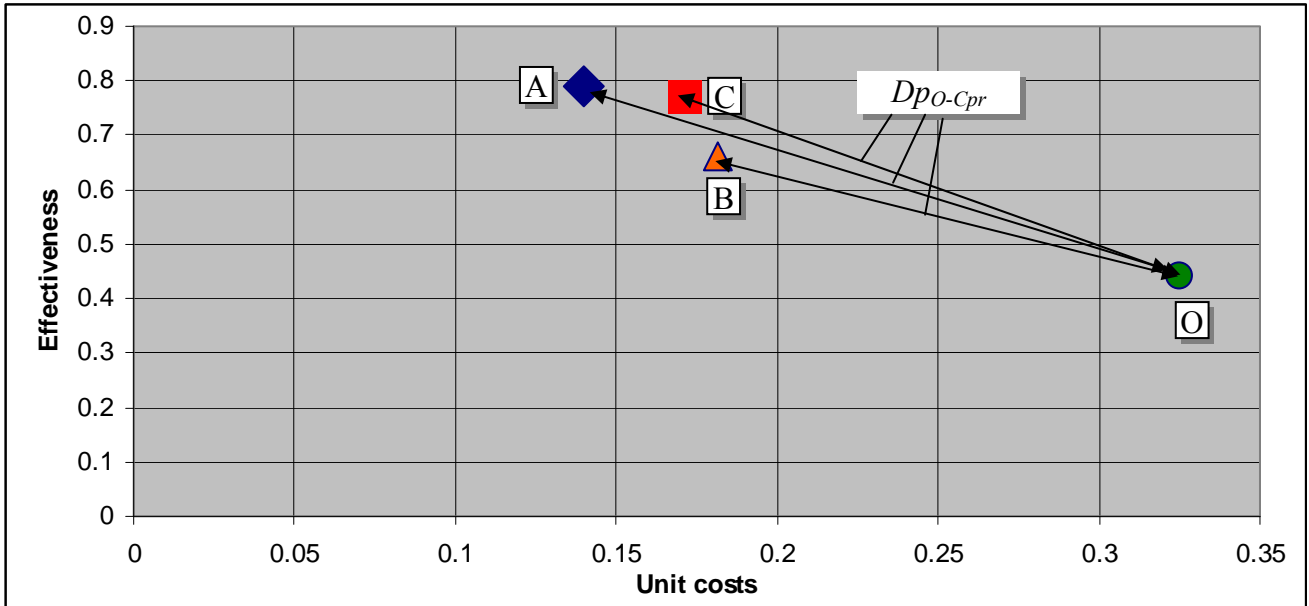


Figure 6. Positions of competitors in Producer Matrix, based on their competencies

Aggregate marks established above led to values of coordinates (x, y) in Producer Matrix (fig. 6). In case of organization O ,

$$x = 1/(kN_{fc}) \quad (3)$$

where k is a constant taken $k=10$, and

$$y = N_{os}. \quad (4)$$

So, the needed coordinates were: $x = 0.32$; $y = 0.44$. Relations (3) and (4) were also applied to determine the coordinates of competitors A, B, C.

It also can be established a distance, Dp_{O-Cpr} between organization O and its competitors, the best being A, as it can be noticed from fig. 6, since it is closer to NW zone in Producer Matrix. The following relation can be used [16]:

$$Dp_{O-Cpr} = \sqrt{(Nos_O - Nos_{Cpr})^2 + k^{-2}(Nfc_{Cpr}^{-1} - Nfc_O^{-1})^2} \quad (5)$$

where: Cpr_r is the competitor r with its corresponding aggregate marks; Dp_{O-Cpr} is measured on 0-1 scale.

Applying relation (5), the distances between organization O and each competitors in Producer Matrix competitors were calculated, and presented in table 1, serving as basis for benchmarking application by Romanian organization. So, in this case, organization can approach the following stages in order to improve its positions in PM, reaching successively the positions of B, C, A. It must be taken into account the competition dynamics, which imposes the application of management principle of continuous analysis of external medium [13, 14].

Table 1. Distances between organization O and its competitors

| Organization | Distance between O and other competitor |
|--------------|---|
| O | 0 |
| A | 0.396 |
| B | 0.262 |
| C | 0.364 |

Another approach of IA evaluation is an internal analysis based on best practices, some of them being presented in [5]. In the table 2, a list of indicators is presented concerning IA evaluation that could lead to SCA obtaining by SMEs that use nonconventional technologies.

Using this list, a qualitative evaluation of an organization intangible assets is possible, with answers like *yes* or *no* depending on identification of respective resources at analyzed organization.

The weights corresponding to these indicators are proposed on the purpose of quantitative evaluation of an organization regarding IA. During analysis, in case that respective resource is identified, it receives the coefficient $c_k = 1$; in the opposite case, $c_k = 0$.

An aggregate mark of indicators related to IA evaluation can be calculated (N_{ia}) using the following relation:

$$N_{ia} = \sum_k c_k \cdot w_k \quad (6)$$

where: c_k is the coefficient corresponding to indicator k (0 or 1); w_k – the weight assigned to indicator k ; the assigned weights fulfils the condition: $\sum w_k = 100\%$.

The results obtained through calculation of N_{ia} proved that ranking could be changed. In this frame, the benchmarking applied by Romanian SME has other milestones, which could be modified depending on dynamics of competition in the nonconventional technologies field, justified above.

The proposed evaluation has the advantage that provides evaluation and ranking though aggregate marks on the scale 0-100, which is very noticeable.

Table 2. List of indicators for intangible assets evaluation that could lead to SCA

| Indicators for intangible assets evaluation | w_k [%] | O | A | B | C |
|---|--------------|-----------|-----------|-----------|-----------|
| 1. □ Detail knowledge of specific needs of customers | 3 | 3 | 3 | 3 | 3 |
| 2. □ Capacity of integration in customers processes | 2 | 0 | 2 | 0 | 2 |
| 3. □ Capacity of offering complete solutions to customers | 6 | 6 | 6 | 6 | 6 |
| 4. □ Capacity of maintaining a permanent contact with customers | 3 | 0 | 3 | 0 | 0 |
| 5. □ Capacity of differentiation against competitors | 4 | 0 | 0 | 4 | 4 |
| 6. □ Developing of products in collaboration with customers | 3 | 3 | 3 | 3 | 3 |
| 7. □ Capacity of adapting processes from organization for satisfying customers needs | 3 | 0 | 3 | 3 | 0 |
| 8. □ Ability to avoid development over the threshold of medium enterprise | 3 | 3 | 0 | 0 | 3 |
| 9. □ Capacity of adapting the rhythm of growing to customers demand | 3 | 0 | 0 | 0 | 3 |
| 10. □ Rapid and precise reaction to threats and opportunities | 5 | 0 | 5 | 5 | 5 |
| 11. □ Capacity of orientation to new markets, on which customers demand customized products | 3 | 3 | 0 | 3 | 3 |
| 12. □ Capacity of alliances and acquisitions achievements, benefiting by products range enhancing | 5 | 5 | 5 | 5 | 5 |
| 13. □ Capacity of forming companies networking, clusters, virtual organizations | 6 | 6 | 6 | 6 | 6 |
| 14. □ Enough diversification for compensation of decline on a certain market segment and enter another one with greater opportunities | 4 | 4 | 0 | 4 | 0 |
| 15. □ Capacity of abroad expansion | 4 | 0 | 4 | 4 | 4 |
| 16. □ Capacity of implementing permanent improvement programs of products quality and costs decrease | 4 | 0 | 4 | 4 | 4 |
| 17. □ Capacity of distribution control | 3 | 0 | 3 | 3 | 3 |
| 18. □ Cautious acquisition of other companies | 3 | 0 | 3 | 3 | 3 |
| 19. □ Organizational culture oriented to customer | 4 | 4 | 4 | 4 | 4 |
| 20. □ Organizational culture oriented to competitor | 5 | 5 | 5 | 5 | 5 |
| 21. □ Organizational culture oriented to continuous innovation | 6 | 0 | 0 | 6 | 6 |
| 22. □ Capacity of organizational learning | 5 | 5 | 5 | 5 | 5 |
| 23. □ Capacity of legislation analysis and initiating business environment improvement | 3 | 0 | 3 | 3 | 3 |
| 24. □ Capacity of focusing on strengths and distinctive competencies | 4 | 4 | 4 | 4 | 4 |
| 25. □ Capacity of focusing on strongly customized products | 3 | 3 | 3 | 3 | 3 |
| 26. □ Capacity of focusing on markets with high potential of growing | 3 | 3 | 3 | 3 | 3 |
| Total weights assigned to indicators / Aggregate marks with relation (6) | 100 | 57 | 77 | 89 | 90 |

3. CUSTOMER MATRIX INTEGRATION

The evaluation using Customer Matrix of products provided by competitors, i.e. electrical discharge machines for micromachining was achieved. It was also taken into account the dynamics of EDM field, respectively time dimension of the analysis by introduction of the concept of Customer Matrix with different time horizons [15]. This was correlated to results obtained at application of producer matrix leading to the following situation of organization O, relative to its main competitors A, B, C (fig. 7).

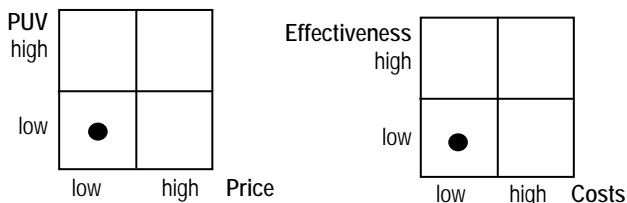


Figure 7. Correlation between Customer and Producer Matrix for organization O

The distance between competitors products ($D_{c_{O-Cp_i}}$) can be calculated with the following relation [16], where PUV and Pp are Perceived Used Value and Perceived Price of SME O and competitors Cp_i :

$$D_{c_{O-Cp_i}} = \sqrt{(PUV_O - PUV_{Cp_i})^2 + (Pp_O - Pp_{Cp_i})^2} \quad (7)$$

4. RISK CUBE INTEGRATION

The three variables of risk cube – product, market, developing strategies are presented in fig. 8 (after [12]). The senses of coordinates system axes indicate the increase of risk degree.

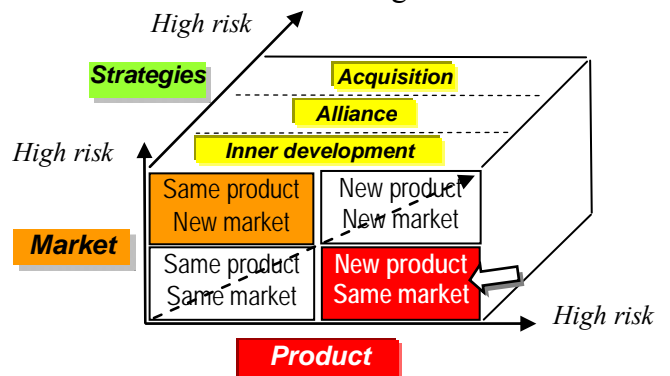


Figure 8. The risk cube variables and possible strategic options

This last integration helps organization to take decision / find solutions to improve its level of competencies connected to intangible assets. The decision process at application of risk cube method covers several stages using CM and PM, aiming at the most adequate strategy for needed competencies acquiring. The logical scheme of the method is presented in fig. 9 (after [12], [13]).

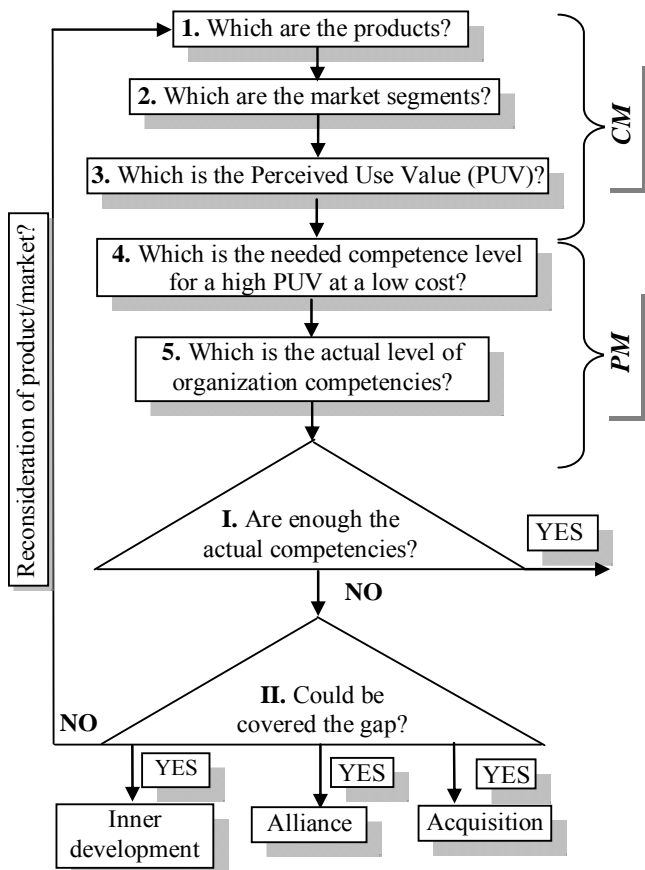


Figure 9. The logical scheme of decisional process at risk cube method utilization

The results of evaluation through PM based method indicated that SME is distanced against its main competitors in terms of needed competencies related to IA, with values lower than 0.5 on 0-1 scale. So, decisions that could be taken are creating alliances by initiating cooperative research projects with Romanian universities and research institutions, firstly achieving same product on same market.

CONCLUSIONS

The proposed methods for evaluation of intangible assets, strongly related to competencies with intangible nature too, have the potential of reaching sustainable competitive advantage. The two evaluation variants with qualitative-quantitative characteristics could generate some slight differences of distances between the analyzed SME against its main competitors, but benchmarking based strategy aiming at recuperation of development gaps remains in principle the same.

6. ACKNOWLEDGEMENT

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7. REFERENCES

1. E.M. Porter, *Avantajul concurențial. Manual de supraviețuire și creștere a firmelor în condițiile economiei de piață*, Teora, (2001).
2. J.B. Barney, W.S. Hesterly, *Strategic Management and Competitive Advantage: Concepts and Cases*, Pearson Prentice Hall Inc., (2008).
3. L. Di Stefano, *Warning to SME's: Integrate Corporate Culture for Competitive Advantage or Risk Losing Market Share*, Mettle Group, (2007).
4. W.J. Stevenson, *Operations Management*, 10th Edition, McGraw Hill, (2009).
5. A. Marcus, *Big Winners and Big Losers*, Wharton School Publishing, (2006).
6. E. Pol, P. Carroll, *An Introduction to Economics with Emphasis on Innovation* (Second Edition), Thomson Learning, Australia, (2006).
7. N. P. Hoffman, An Examination of the "Sustainable Competitive Advantage" Concept: Past, Present, and Future, *Academy of Marketing Science Review*, no. 4, pp. 1-16, (2000).
8. D. Ghiculescu, et al., Distance against Competitors from the Field of Concentrated Energies Technologies Evaluated through Elements of Customer Matrix, *Proceedings of The 6th International Conference on Manufacturing Engineering, WSEAS*, pp. 178-183, (2013).
9. * * *, Valuation of the intangible asset, "brand", Austrian Standard, A 6800, (2010).
10. K.E., Sveiby, *Measuring Intangibles and Intellectual Capital - An Emerging First Standard*, Available at: <http://www.sveiby.com/articles/EmergingStandard.html>, Accessed at: 2014-07-10.
11. * * *, *EVLIA tool*, available at: <http://www.evlia.eu/>, accessed at 2014-07-10.
12. D. Faulkner, C. Bowman, *Elements of competitive strategy*, Teora, Bucharest, (2000).
13. D. Ghiculescu, *Strategic Management*, Printech, Bucharest, (2007).
14. D. Ghiculescu, *Production quality*, Printech, Bucharest, (2004).
15. Daniela Ghiculescu, N.I. Marinescu, D. Ghiculescu, C. Pirnau, Customer Matrix with Different Time Horizons Applied to Electrodischarge Machines, *Applied Mechanics and Materials*, Vol. 371, pp. 220-224, (2013).
16. Daniela Ghiculescu, D. Ghiculescu, S. Marinescu, Difficulty of Duplication and Maintaining of SCA in the Field of Nonconventional Technologies, *Proceedings of MSE 2013*, Sibiu, pp. 65-68, (2013).