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Threshold Management in an Enterprise

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1. Introductory remarks

This paper outlines the problems connected with threshold management, based on threshold analysis. The starting point of the threshold analysis is the fact that enterprises, in their activities and time and spatial development, encounter some constraints resulting from various reasons. Analyzing the influence of these constraints, defined as thresholds, we can assume that they lead to the disturbance of their functioning and create discontinuity of their development processes. A very important feature of these constraints, which are by no means absolute, is the fact that they can be eliminated, but at additional, often quite huge, costs. These costs can be called threshold costs.

As a result of basic assumptions of the threshold analysis, costs can be divided into normal (NC) and additional (AC) ones. Normal costs determine standard conditions, whereas additional costs usually define unconventional (of new quality) conditions in which an enterprise functions. It is determined by the following definition: the threshold for the system in the period from 0 to t is such an effect of its functioning e , at which the next unit cannot be produced at present unit cost [Kozłowski 1974, p11 and next]. In this context, the basic aims of this paper can be formulated as:

- to single out the areas of threshold management,
- to formulate the methodology of threshold management,
- to show the specific application of the tree of threshold analysis of raw material costs.

2. Classification assumptions of the management areas

A series or classifying description is a vital aspect of the characteristics of a research problem. The former consists in placing the elements of a set in rows or series, comparing them in some aspects and defining the order of



their occurrence. The latter is characterized by the fact that the elements of an analyzed set are subordinated to some concepts and are included in categories which constitute ranges of these concepts. The scales similar to those used in logics are applied here, namely: nominal, ordinal, sectional and quotient ones [Steczkowski, Zeliaś 1977, p.27]. Moreover, the classification methods of defining and describing the elements of a set are well placed in the logics of predicators, whereas the logics of relations is necessary to explain the structure of a series arrangement [Ziemski 1967, p.46].

Classification as a concept can be analyzed in semantic, logical, and set-theoretic aspects. Professional literature provides various definitions of this concept. Below, some of them are presented:

- “division of a set of objects into subsets so that there are no objects which do not belong only to one subset and each object from the divided set belongs to some subset” [Pszczółowski 1978, p.96].
- the process of dividing a set of objects into classes (categories), where the concept of a class means a set of objects characterized by some common properties [Gatnar 1998, p.13],
- the process of categorizing objects or events into separate classes, or the result of this process [Reber 2000, p.301].

Classification is also considered as a section of general methodology, and, together with information gathering and modeling of phenomena, it is one of basic tools of researching the reality. This concept is also understood as a set of principles on the basis of which the division is made. Finally, it is considered as an outcome of the classification process [Lisiński 2004, pp.297-298].

In our further analysis it is vital to understand this concept as a process of dividing-connecting, which, through multifunctional reshaping of the structure of an analyzed set or object leads to the arrangement of its elements [Statystyczne metody... 1998]. In order to carry out the classification we must apply a specific course of a scientific process, and especially [Grabiński, Wydymus, Zeliaś 1989, p.12; Grabiński 1992, p.25; Steczkowski, Zeliaś 1997, p.31]:

- determine the classification space,
- define the criterion of grouping
- choose a proper taxonomic or classification method.

In order to carry out a proper classification it is also necessary to observe logical postulates, such as: the clarity of formulated criteria, the possibility of making inductive generalizations and the creation of many classification systems of the collectivity depending on the area of observation. Thanks to them it is possible to learn

the reality by means of reducing entropy and creating scientific theories [Gatnar 1998, p.13].

The subject of classification here is the modified set of decision and information courses (areas), called statistical objects (C). Each of these courses will be analyzed as a so-called taxonomic operational unit.

The basic aims of the classification process will be [Wdowiak w. 2007]:

- to differentiate the types of decision and information courses (areas) in the aspect of the threshold analysis of an enterprise,
- to indicate the methods of cost calculation and corresponding threshold measures,
- to indicate appropriate kinds of thresholds adequate to the differentiated threshold types.

The classification space will be the set of features of the division of decision and information courses, typical of analyzed decision areas in the aspect of threshold analysis of an enterprise. In this way they become the evaluation criteria. When choosing the criteria, structural and functional aspects of the analyzed objects were taken into account, special attention was paid to:

- general aims,
- typical features of an analyzed object,
- the range, specific methodology and method of management,
- particular aims, methods of cost calculation and threshold analysis measures,
- threshold costs, kinds of thresholds, and
- the sphere of effects.

3. Registration of management areas and their classification.

As we could see, it was very difficult to establish complex classification criteria of decision and information courses (areas) in the aspect of threshold analysis. It is equally difficult to univocally, comprehensively and separately define the set of these decision areas as a full initial set for classification. The viewpoints of theoreticians of enterprise and management as well as the opinions of managers are not unanimous.

In the language of taxonomy, the objects and the subjects of the analysis are the information-decision areas (courses). They are characterized by statistical features, such as general and specific criteria of classification. Therefore, we can say that the areas (courses) are the subject of classification, and criteria constitute the space of classification. To group the subjects of classification in classification space, the Ward method was used [Ward J.H. 1963], which assumes gradual joining of single objects

(and then their groups) until all objects belong to one group. At each stage two subgroups which give the lowest increase of general variance inside the group are joined. This process is called the agglomeration. It is vital to choose the moment at which we break the agglomeration process so that we reach the final division. The professional literature provided over thirty various methods of finding the final division. However, good results can be usually obtained using the analysis of a "dendrogram", that is the connection tree. It is also important to assume the measure of distance. In our case, from the statistical perspective, all criteria are quality variables, and a proper choice of a criterion is the so-called percentage inconsistency. Therefore, the distance is the percentage of features, in which two objects did not take the same variant [Statistica PL...1997].

On the basis of the above assumptions, regularities and relations, relying on the opinions of enterprise, management, and management accountancy experts, the matrix of values of information-decision areas (courses) division criteria was built [Wdowiak W. 2007].

After presenting the initial, synthetic and author's own version of the list of information-decision areas and outlined tendencies, and after numerous consultations with enterprise, management and management accountancy experts – on the level of 0.8051 measured by Kendall and Babington-Smith concordance coefficient [Wdowiak W. 1980], a 52-element detailed list of these areas, covering elements C1-C52 in the classification tree of information-decision areas (courses), was established.

It became the basis of statistical calculations, using the Ward method, as a result of which the classification tree shown in figure 1 was obtained.

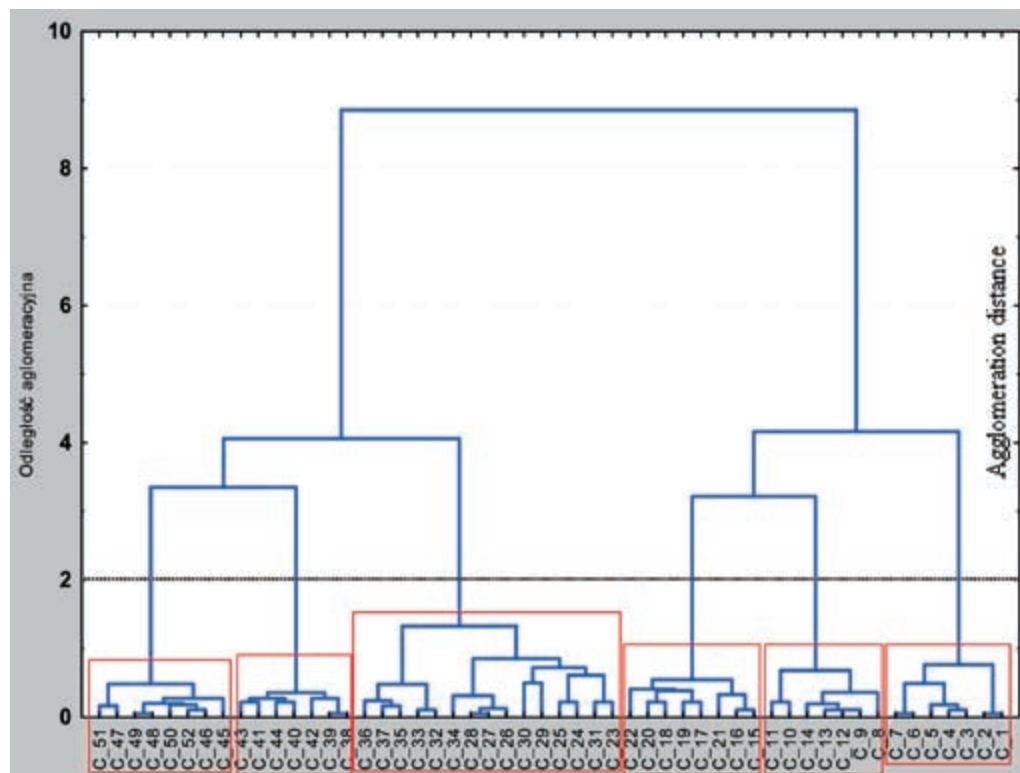


Figure 1. The classification tree of information-decision areas (courses)

This tree enables us to differentiate six synthetic information-decision areas (courses), such as [Wdowiak W. 2007]:

- I. Preparing the strategy of actions and development
- II. Designing strategic management
- III. Management organization and development restructuring
- IV. Reorganization and reparation restructuring,
 - a) Vertical reorganization
 - b) System reorganization
 - c) Reparation restructuring
- V. Operational activity management
- VI. Evaluation of operational, strategic and development activities.

A detailed tree of synthetic information-decision areas (courses) takes the following shape [Wdowiak W. 2007]:

- I. Preparing the strategy of actions and development
 1. Defining the mission and the vision,
 2. Defining strategic aims,

3. Segmentation and forecasting the market share,
 4. Forecasting the product assortment,
 5. Pricing policy,
 6. Forecasting the network of distribution channels,
 7. Public relations and promotion.
- II. Designing strategic management
8. Marketing designing and planning,
 9. Financial designing and planning,
 10. Employment planning,
 11. Logistics designing and planning,
 12. Research and development designing and planning,
 13. Production designing and planning,
 14. Technical and technological designing and planning
- III. Management organization and development restructuring
15. Project and innovation management,
 16. Diversification and winning new markets
 17. Rationalization of employment
 18. Starting activities in new spheres
 19. Technical and technological progress and innovations,
 20. Upgrading the assortment and the product designs,
 21. Diversification of supplies and markets,
 22. Rationalization of finances and prices.
- IV. Reorganization and reparation restructuring
- a) Vertical reorganization
 23. Planning the range and management of changes,
 24. Certification of quality systems and efficiency management,
 25. Perfecting the organizational and legal system,
 26. Designing and perfecting the organizational structure,
 27. Upgrading and perfecting the production systems,
 28. Logistics of supplies and markets
 - b) System reorganization
 29. Improvement of problem-solving and decision-making,
 30. Improvement of information and communication system,
 31. Improvement of administration procedures,
 32. Improvement of work organization,
 - c) Reparation restructuring
 33. Restructuring of employment and improving the staff,
 34. Modification of motivation and payment systems,

35. Restructuring finances and finance management,
 36. Modernization of supervision and controlling systems,
 37. Reorganization of administration and management,
- V. Operational activity management
38. Maintaining technical efficiency of fixed assets,
 39. Ensuring the compliance of technological processes with documentation and norms,
 40. Managing the personnel and the human factor,
 41. Production management
 42. Maintaining the organizational efficiency of the administration,
 43. Securing the supplies and the markets,
 44. Finance management
- VI. Evaluation of operational, strategic and development activities.
45. Modern technologies,
 46. Use of assets,
 47. Economic efficiency of the activity,
 48. Rationality of personnel management and motivation,
 49. Efficiency of production servicing,
 50. Effectiveness of management and administration services,
 51. Rationality and modernity of production,
 52. Effectiveness of marketing and supplies and sales logistics.

4. The outline of methodology of management in the threshold aspect.

The method of threshold management is a formalized method of management, supported by the threshold analysis of the organization. It is characterized by the democratic and integrative style of management, based on cooperation between the manager and his/ her subordinates. It relies on identification, decomposition, observation, analysis and realization of the complex and partial threshold aims (tasks), formulated by means of threshold measures in the context of all or some methods of calculating the total, variable, final costs of the process or tasks, within the management function. It uses the operational controlling principles, integrating the enterprise activities aimed at the increase, profit and development of workers, taking into account the present or projected organizational structure. In this system of management, the environmental context is essential, referring both to the environment of the organization, as well as to the ethical, social and global aspect of management.

This method seems to be more useful and concretized through the system of set main goals and decomposed partial aims, expressed in quantitative measures, specific for the cost calculation methods, than the traditional system of management

by objectives, for which it is more proper to formulate descriptive aims, rather of the qualitative than quantitative type. Therefore, the method of threshold management enables us to answer more concretely, precisely and systematically the following questions [see: Humble 1975, pp.15-16]:

1. Are the adopted aims of the enterprise and the existing plans based on solid foundations and are they real enough to create conditions enabling us to reach the perspective goals, while at the same time securing temporary increase of profit?
2. Do the companies and the managers know exactly what to do to realize these plans?
3. Do the managers let the precious, high-quality resources be engaged into activities which do not promise achieving high or even average effects?
4. Is the executive team well-motivated to work and are they personally involved in striving to reach the set goals?
5. What kind of economic activity does the company intend to lead in the future?
6. From what sources will the company make its profits in the future, if we take into account the predicted external difficulties as well as strengths and weaknesses inside the company?

We should also pay attention to the fact that in the western countries, apart from traditional, organizational methods and techniques, they also use, as the auxiliary methods in management by objectives, the following ones: budgeting, cost planning and long-term planning. Taking all these aspects into threshold management, we can claim more precisely, that, apart from organizational methods and techniques, the additional methods consist of specific methods of cost calculation, budgeting, and the analysis of the break-even point, which are covered by the threshold analysis of the enterprise.

The method of threshold management also takes some models from various management techniques. For example, in spite of the above remarks, certain elements of applications can be taken from management by objectives [Zarządzanie przedsiębiorstwem...2000, pp.126-137], such as those referring to the key result areas (KRA), the influence on result card (IRC), the executive's task card (ETC), the company improvement plan (CIP), individual improvement plan (IIP), or the result review card (RRC). On the other hand, the process of motivating was adopted from the management by motivating [Zarządzanie przedsiębiorstwem...2000, p.210] and constitutes now an integral part of the proposed methodology of threshold management. From the management by participation the threshold management took the idea of allowing the participation of executive workers in the decision-making process, that is participation in power on the third (consultation) and partly fourth level (workers' supervision of the company activities), especially in planning activities

and meeting the plans [Zarządzanie przedsiębiorstwem 2000, p.182]. The threshold management also uses those elements of management by delegating which refer to delegating some formal authority to the person on a lower position together with the responsibility for carrying out certain tasks [Zarządzanie przedsiębiorstwem...2000, p.210]. As far as the management by tasks is concerned, the elements referring to generating ideas and tasks by executives should be adopted [Zarządzanie przedsiębiorstwem...2000, p.220], as these tasks in threshold management can result from the threshold analysis of an enterprise. This process should consist in preparing a set of period tasks by the executive, delegating them to the workers at the briefing and controlling the realization of these tasks. If we adopt formalization from management by formalization, this can result in developing standards and norms to be used in the company in similar situations. This can also stimulate us to prepare a relatively complete and coherent operational documentation of an organization [Zarządzanie przedsiębiorstwem...2000, p.232]. The threshold management borrows a lot from the management by controlling, for example in complex planning of material, financial and cost tasks, steering its activities by the so-called responsibility centers, as well as supporting the top management with new versions of the strategy of company development, which take into account the observed and expected changes in the environment [Zarządzanie przedsiębiorstwem...2000, p.262].

As a result, taking over some elements of the above management methods, and above all, a novel threshold approach to the enterprise determines specific methodology of threshold management, which should proceed along the following modified stages:

1. Defining the aims of the organization.
 - 1.1. Building the strategy and formulating assumptions.
 - 1.1.1. Analysis of the environment and systemizing external aims.
 - 1.1.2. Identifying opportunities and threats.
 - 1.1.3. Identifying needs.
 - 1.1.4. Pointing out strengths and weaknesses of an enterprise.
 - 1.1.5. Setting the system of internal aims and necessary input data.
 - 1.1.6. Agreeing the assumptions and developing the strategic plan.
 - 1.2. Identification of system levels of efficiency (organization, process, work post).
 - 1.2.1. Building the hierarchy of efficiency levels (diversification method, analysis of preferences).
 - 1.2.2. Choosing the method of cost calculation (total, variable, process, task, outcome costs).
 - 1.2.3. assuming the threshold evaluation measures (cost, quantitative not cost, qualitative measures).

- 1.3. Setting the threshold aims of an organization.
 - 1.3.1. Assessing extreme thresholds.
 - 1.3.1.1. Identification of thresholds pointing at the kind of general border constraints.
 - 1.3.1.2. Laying out the area of the analysis through aggregating the values of border constraints.
 - 1.3.2. Assessing the intermediate thresholds.
 - 1.3.2.1. Creating the list of indirect threshold factors and their division.
 - 1.3.2.2. Showing the aggregate first and indirect threshold in the analyzed area (aggregation of results).
 - 1.3.2.3. Isolating the main research areas through aggregation of indirect threshold areas.
 - 1.3.2.4. Pointing out critical thresholds.
 - 1.4. Calculating the threshold costs.
 - 1.4.1. Drawing up the factors causing direct threshold costs in main threshold areas.
 - 1.4.2. Calculating direct costs of main threshold areas.
 - 1.4.3. Calculating indirect threshold costs of the main areas of the analysis.
 - 1.4.4. Establishing the critical development thresholds of the analyzed area.
2. Planning (budgeting) and improving management.
 - 2.1. Preparing the plan (budget) of action.
 - 2.1.1. Analysis and variation of the threshold values of the organization.
 - 2.1.2. Establishing key tasks for the management and planned results.
 - 2.1.3. Planning tasks for executive posts.
 - 2.1.4. Developing operational and financial plans (budgets).
 - 2.2. Organization and controlling system levels of efficiency.
 - 2.2.1. Evaluation of the strategy of the organization (product and service offer, markets as groups of clients, product and market priorities, strategic advantages).
 - 2.2.2. Evaluation of the process management (realization of aims, monitoring results, allocation of resources, relations between departments).
 - 2.2.3. Evaluation of the posts (division of tasks and responsibility, order of activities, principles of rewarding, procedures, ergonomics and working conditions).
 - 2.3. Motivating workers.
 - 2.3.1. Identification of predispositions, needs and aspirations of the workers.

- 2.3.2. Showing a set of motivators.
- 2.3.3. Constructing a system of motivation.
- 2.3.4. Adjusting the motivation system to the system of organization's aims.
- 3. Supervising the execution of the plan and improving management.
 - 3.1. Current supervision of tasks and planned results.
 - 3.2. Periodical check of execution of operational and financial plans (budgets).
 - 3.3. Periodical analysis of the execution of the plan, focusing on the values of extreme, indirect and critical thresholds.
 - 3.4. Periodical analysis and correction of the organization's strategy, process management, and the functioning of posts.
 - 3.5. Preparing periodical reports.
 - 3.6. Determining deviations of periodical results from the planned values and threshold values.
 - 3.7. Periodical analysis and modification of the motivation system.
 - 3.8. Analysis of the execution of external (strategic) aims.
 - 3.9. Adjustment of external and internal aims, threshold values and planning assumptions.

5. The tree of threshold analysis of the costs of raw material use.

The problem of accepting the costs of using raw bristle and raw horsehair used in production of paintbrushes, brushes and brooms as the cost of acquiring revenue can be presented by means of the tree of threshold analysis, similar to a decision-tree. In order to do so we have to make a small modification of a classic decision-tree, introducing the following changes and principles typical of this problem:

- the threshold (decision) knot should be marked with a square but with a symbol of an envelope, in its left quarter we should write the value of the calculated profit (real or planned), and in the other three quarters the calculated or planned profit in accordance with the variants of accepting the costs of acquiring the revenue, shown in the random knots,
- the random knot should be marked with a circle and divided into four quarters by means of two diameters, assuming that in the left diameter we should write the value of costs (real or planned) and in the other three quarters the figures accepted as the costs of acquiring revenue, in accordance with the created real variants, connected with the real situations which took place,
- above the decision knot we can write the value of achieved or planned revenue, necessary to calculate the profit in appropriate quarters of the envelope,
- the branches coming from the threshold knot describe the alternatives to the threshold analysis,

- the branches coming from the random knot describe the potential conditions or results of the threshold analysis, determined by appropriate measures and the likelihood of these events happening and obtaining these results.
- The tree of the threshold analysis referring to the analyzed case of tax control regarding proper documentation of raw material purchase is presented in figure 2.

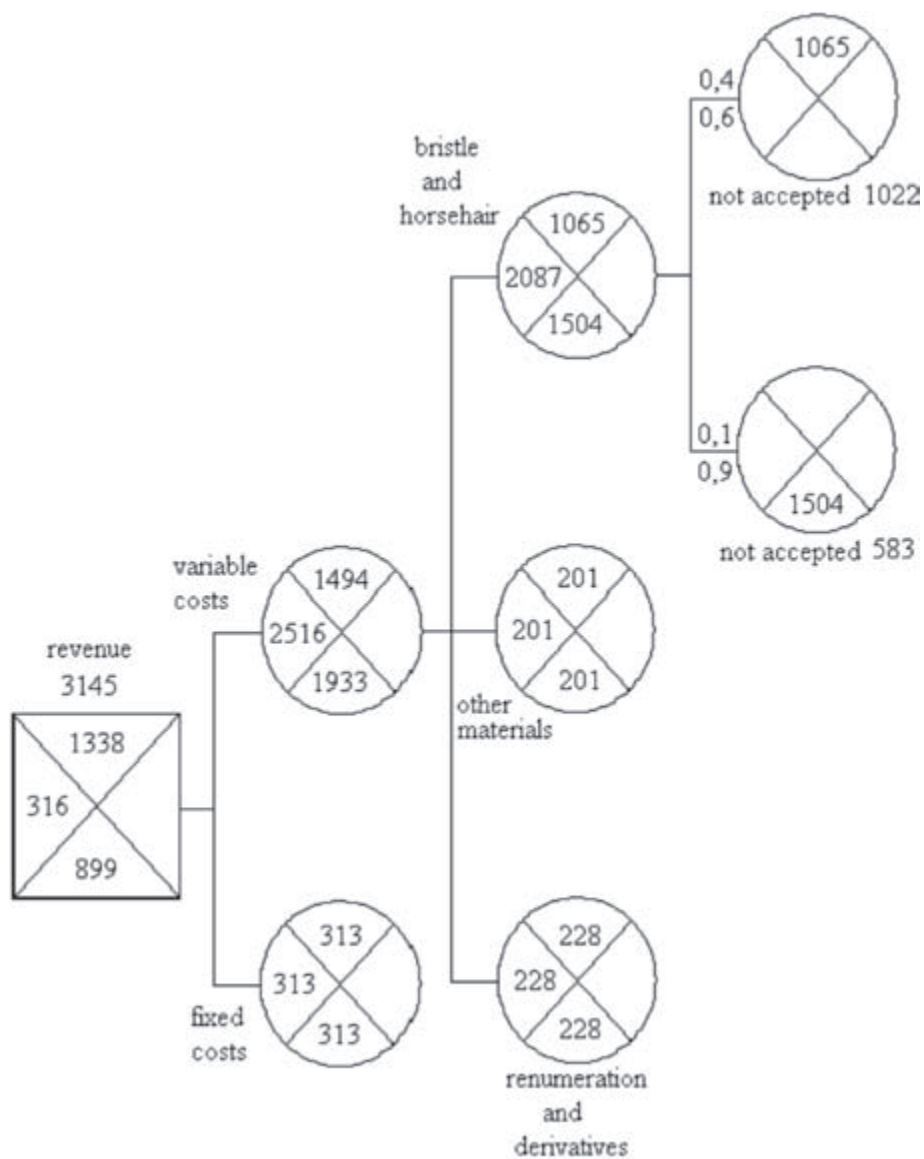


Figure 2. The tree of the threshold analysis of accepting the use of raw materials as the costs of acquiring revenue.

The structure of the tree of the threshold analysis from the left to the right enables us to determine the initial situation. In our case, the calculated financial result amounting to 316,000 zlotys, placed in the left quarter of the envelope results from the difference between the revenue of 3,145,000 zlotys from sales of paintbrushes, brushes and brooms, placed above the envelope and the sum of variable costs 2,516,000 zlotys in the left quarter of the upper random knot and the sum of fixed costs in the left quarter of the lower random knot of the first column. The total sum of variable costs 2,516,000 zlotys, consists of the costs of raw horsehair and raw bristle, 2087 zlotys, in the left quarter of the upper random knot, the costs of other materials, 201,000 zlotys, in the left quarter of the middle random knot and the costs of remuneration and derivatives, 228,000 zlotys, in the left quarter of the lower random knot of the second column. In the upper branch coming from the random knot we show the costs not accepted in the first version by the Tax Office, amounting to 1,022,000 zlotys, due to their improper documentation in light of the Bill on Accountancy, assuming the likelihood of its correctness at 0.4 (incorrectness – at 0.6). Therefore the figure of 1,065,000 zlotys represents the costs of used raw horsehair and raw bristle accepted by the Tax Office. This sum, that is 1,065,000 zlotys, was transferred to the upper quarter of the upper random knot, as well as the sum of 201,000 zlotys was transferred to the upper quarter of the middle random knot and 228,000 zlotys to the upper quarter of the lower random knot of the second column, because the latter two sums did not change.

Having built the decision tree, the solution to the threshold problem can be found going backwards from the final results. That is why the sum of variable costs in the upper quarter of the upper random knot, amounting to 1,494,000 zlotys is the sum of costs transferred respectively to the upper quarters of random knots of the second column (1,065,000+201,000+228,000). The financial result of 1,338,000, as a result of not accepting the part of used raw material for the production as the cost of acquiring revenue (2,516,000-1,494,000=1,022,000) is the difference between the revenues 3,145,000 zlotys (above the threshold knot) and the sum of variable costs, 1,494,000 zlotys and fixed costs 313,000, written in the upper quarters of random knots of the first column. A similar course and method of calculating should be applied to the second variant of not accepting the use of raw bristle and raw horsehair as the costs of acquiring revenue at the amount of 583,000 zlotys (the second branch from the top, coming from the upper random knot of the second column). Moreover, we should add that the likelihood defined in the analyzed threshold case results from the assessment of the legal conditions.

Summing up, we must admit that the financial result calculated by the taxpayer (316,000 zlotys) differs from the financial results of the two presented variants (1,338,000 zlotys and 899,000 zlotys), resulting from the sums questioned by the Tax

Office, representing the costs of use of raw horsehair and bristle, documented by internal notes. As a result of questioning these costs, in the first case, the profit rose by 1,022,000 zlotys (1,338,000-316,000), which forces the taxpayer to pay the tax of 408,800 zlotys (40% from 1,022,000 zlotys), which together with penalty interest amounts to over 700,000 zlotys to be paid to the budget, whereas in the second case, the profit rises by 583,000 zlotys (899,000-316,000), which forces the taxpayer to pay the tax of 233,200 zlotys (40% from 583,000 zlotys) and together with penalty interest it amounts to over 350,000 zlotys to be paid to the budget.

It would seem that the problems of using raw bristle and raw horsehair bought from farmers to be used in the production of paintbrushes, brushes and brooms do not exist, but the method of documenting these purchases in case of unclear regulations, and especially unclear interpretation of these, can cause problems of a threshold type, which can even lead to the bankruptcy of the company. We should add here, that the time scope of the check was 2001, the time when the 40% rate of income tax from the profit was valid, and the tax was calculated on the so-called "general principles". At the moment of purchasing these raw materials on the basis of internal notes, a legal problem of a threshold type existed, referring to the amount of the final profit, the problem that could even lead to the bankruptcy of the company. Only cautious actions saved the company from this danger, but the taxpayer had to undergo a difficult, 2-year period of problems with the Tax Office, which luckily were unsubstantiated and which were finally solved. This situation could wreck the efforts of the taxpayer to develop his company and could question the effectiveness of his methods of managing the overheads costs.

Bibliography

- Gatnar E. 1998. Symboliczne metody klasyfikacji danych. Wydawnictwo Naukowe PWN, Warszawa.
- Grabinski T. 1992. Metody taksonometrii. Wydawnictwo Akademii Ekonomicznej, Krakow.
- Grabinski T., Wydymus S., Zelias A. 1989. Metody taksonomii numerycznej w modelowaniu zjawisk społeczno-gospodarczych. Państwowe Wydawnictwo Naukowe, Warszawa.
- Humble J. W. 1975. Zarządzanie przez określanie celów. Państwowe Wydawnictwo Ekonomiczne, Warszawa.
- Kozłowski J. 1974. Analiza progowa. Państwowe Wydawnictwo Naukowe, Warszawa.
- Lisinski M. 2004. Metody planowania strategicznego. Polskie Wydawnictwo Ekonomiczne, Warszawa.

- Pszczolowski T. 1978. Mała encyklopedia prakseologii i teorii organizacji, Zakład Narodowy imienia Ossolińskich. Wydawnictwo, Wrocław, Warszawa, Kraków, Gdańsk.
- Reber A. S. 2000. Słownik psychologii, Wydawnictwo Naukowe Scholar, Warszawa.
- Statistica PL dla Windows. 1997. StatSoft Polska Sp. z oo, Kraków.
- Statystyczne metody analizy danych. 1998. Praca zbiorowa pod red. W. Ostasiewicza. Wydawnictwo Akademii Ekonomicznej, Wrocław.
- Steczkowski J., Zeliś A. 1997. Metody statystyczne w badaniu zjawisk jakościowych, Wydawnictwo Akademii Ekonomicznej w Krakowie, Kraków.
- Ward J. H. 1963. Hierarchical grouping to optimize an objective function. Journal of the American Statistical Association, 58,236.
- Wdowiak W. 1980. Technika delficka, Problemy Postępu Technicznego nr 1.
- Wdowiak W. 2007. Typologia obszarów badawczych w analizie progowej zarządzania przedsiębiorstwem [w]: Ekonomia, Zarządzanie, Marketing. Wyższa Szkoła Biznesu-National Louis University, Nowy Sącz.
- Ziemski S. 1967. Metoda typologiczna i jej zastosowanie w prakseologii, Prakseologia nr 26.
- Zarządzanie przedsiębiorstwem przyszłości. Koncepcje, modele, metody. 2000. Praca zbiorowa pod red. K. Perechudy. Agencja Wydawnicza Placet, Warszawa.

