

## MATHEMATICAL ALGORITHM FOR DETERMINING HIDDEN COSTS GENERATED BY PERSONNEL FLUCTUATIONS

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**Abstract.** *The current economic entity focused on minimizing costs and maximizing profits faces hidden costs that have a negative impact on economic performance. Hidden Costs can be generated by malfunctions, such as absenteeism, staff rotation, productivity deviations, non-quality, and work-related accidents are commonplace. In this article it is concentrated to identify the hidden costs generated by the personnel fluctuation. Scientific research emphasizes that these hidden costs can be identified and quantified through mathematical estimations by algorithms. Thus, it will start from the distribution of direct productive staff, the distribution of employee's matrix and the percentage fluctuation matrix in order to determine the movements caused by these departures over a year.*

**Keywords:** *mathematical algorithm, hidden costs, rotation of staff, iteration, matrix.*

### 1. INTRODUCTION

Within the 21st century business environment, the economic entity is defined by: responsibility, autonomy, medium and long-term strategies, risk prevention, resource efficiency, environmental concern, and resource conservation to ensure continuity for future generations [1,2]. The management accounting through its means and instruments supports the strategy of the economic entities, being oriented towards the future its main objective is the performance and implicitly its maximization [3,4]. Thus, management accounting plays a fundamental role in the strategic piloting of organizations [5]. Performance represents "a state of competitiveness of the economic entity achieved by a level of efficiency and productivity that ensures a sustainable presence on the market" [6]. Financial performance is a measure of the company's total business [7], and has to be appreciated in relation with the factors that influence it [8]. For a long time, management has seen economic performance characterized by competitiveness, quality, efficiency and effectiveness indicators as a criterion for assessing performance to the detriment of social performance that is characterized by socially

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satisfactory employee satisfaction [9]. The performance of an economic entity begins to decline as the disfunctionality occurs [10]. These malfunctions are the starting point of hidden costs and can be defined as disruptions or anomalies that affect the functioning of an organization, and hidden costs represent the monetary expression of their regulation activities [11]. The malfunctions are resource-consuming, for their correction the organization sustains a series of additional costs related to either human activity or some additional consumption of material resources [12-17]. Hidden costs are the monetary expression of disfunctionality regulation activity. Institute of Socio-Economics of Entrepreneurs and Organizations (ISEOR) highlighted the link between malfunctions, hidden costs and the performance of the organization. Thus, hidden costs result from a permanent and complex action between the structures of the organization and the human behaviors that create both functions and dysfunctions within it [18-21]. Malfunctions are the starting point for hidden costs and can be defined as disruptions or anomalies that affect the functioning of an organization [22]. They find some or all of their roots in a change in employee behavior and can be analyzed from two points of view [14]: i) starting from their causes, the malfunctions are social indicators whose variations depend on the organization's social climate; ii) highlighting their effects, they constitute anomalies, disturbances in the functioning of a system. From this perspective, they impose the need to evaluate the costs they generate, as well as identify solutions to reduce these costs. The specialized literature reviewed the following categories of malfunctions that may occur in the functioning of an organization: absenteeism, work accidents, staff rotation, social conflicts, non-quality or quality defects, productivity deviations [12].

## 2. MATHEMATICAL DETERMINATIONS OF HIDDEN COST DETERMINED BY PERSONNEL ROTATION

The rotation of staff can be considered a disability when staff fluctuations (inputs and outputs in the micro-space: workshop, department, agency, including internal changes, etc.) cause disruption to the organization [12]. The rotation of staff is the fluctuation which refers to the number of people who voluntarily or involuntarily change their workplace within the organization (internal rotation of employees) or outside of it over a period of time. The main reasons for the departure of employees are grouped in [14]: *departures due to the employer*, caused by the lack of competence of the employee, penalties, dissolution of the individual labor contract in case of seasonal activities, diminution of production, etc.; *departures due to the employee*, which may be controllable by the organization (eg departures due to inappropriate remuneration, working hours, working conditions, external promotion, etc.) or uncontrollable (eg sickness, accidents, change of home, events such as death, marriage, maternity leave, study leave, etc.); *departures for unknown reasons*, in this category it encounter those cases that do not fall into any of the above-mentioned categories.

Personnel fluctuation can be measured using the following indicators:

- a. *The global rotation rate*, which is calculated by: professional categories of employees (workers, technical, administrative, economic), by seniority, sex, nationality, geographical area etc.

$$\% \text{Global Rotation Rate} = \frac{\text{No. of employees departed in period } "T"}{\text{Average number of employees in period } "T"} \times 100$$

*b. Global stability rate:*

$$\% \text{ Global Stability Rate} = \frac{\text{No. of employees working for more than } n \text{ years}}{\text{No. of employees in year } (N-n)} \times 100$$

where:  $n$  - is the number of years corresponding to a significant seniority for the organization;  
 $N$  - is the current year.

Depending on the results obtained from the calculation of the two indicators, it can figure out various conclusions, such as: a high fluctuation rate in relation to low-paid employees may be the result of integration problems and the appearance of significantly different results on compartments, units, sections for the same category, reflect possible dysfunctions generated by the social climate in the organizational environment.

Within the hidden costs of hiring a person, the following categories are distinguished [12, 23-25]: i) *Hidden costs related to personnel recruitment*, which requires time from the human resources department, as well as from the management side. In this category, it identifies recruitment expenses (e.g., job vacancies, tests, recruitment firms, etc.); ii) *Hidden costs of training the recruited person*, when the training is prior to the commencement of the activity; iii) *Hidden costs of adapting the recruited person*, related to the knowledge of the position, department and organization. Normally the adaptation process ends with a sub-activity, resulting in hidden costs related to non-production, regardless of the complexity of the workplace. Also included in this category is the cost of integration, which reflects the productivity gap between the time of departure of the former employee and the time when the person replacing him becomes performing. In this context, hidden costs are learning time, lack of experience, impact on the organization's image, loss of working time, decreased quality and efficiency difference. As part of the research undertaken, the starting point is the epistemological positioning of research that allows achieving the proposed goal of identifying and measuring hidden costs generated by rotation of staff within an economic entity in the construction industry.

### 3. RESULTS AND DISCUSSION

In recent years staff fluctuations have become a costly problem facing many organizations in our country. Given that this phenomenon involves some costs, it needs to be constantly monitored to keep it under control by the economic entity. An employee leaving disrupts the good performance of an organization, which involves either finding a substitute within a short time, who will not have enough time to integrate, and thus its performance will be weaker either for a period of time, the tasks of the one left are taken over by his colleagues, which leads to a much lower efficiency due to the higher workload. Thus, the costs generated by this malfunction depend on the management's decision to replace the staff or not, as well as on the way this action is taken. Hidden costs are generated by a number of factors, such as the time factor in the recruitment and training process, the integration and accommodation times of the new income, also in the case of hiring new employees, they are generated by the hardship of the activity and the decrease in productivity due to the lack of the experience of newcomers, loss due to the opportunity cost. In the case of employees leaving for competition, losses are impossible to quantify. In this study, it will analyze the direct productive personnel that it will categorize in the following three categories:

- category A - direct productive staff consisting of: team leaders and skilled workers (carpenters, plumbers, ironmongers, welders, painters, electricians, masonry, tinsmiths, mechanical locks, etc.);

- category B - direct productive staff consisting of: chief engineers, engineers, technicians, heads of sites, heads of work stations, logistics personnel;
- category C - direct productive staff consisting of: project managers, production managers, project managers, planning experts, procurement experts, budget experts, contracting experts, settlement experts, bid and sales experts.

Regarding the seniority of the employees in the organization, according to the records of the Human Resources department it has the distribution presented in Table 1.

**Table 1. Distribution of employees directly productive by seniority in the organization**

	0-2 yrs	3-5 yrs	+ 6 yrs	Total
Category A	110	95	45	250
Category B	20	26	29	75
Category C	11	25	34	70
Total	141	146	108	395

Given:  $R = \begin{pmatrix} nA \\ nB \\ nC \end{pmatrix} = \begin{pmatrix} 250 \\ 75 \\ 70 \end{pmatrix}$  the distribution matrix of directly productive employees,

classified by the three categories mentioned above (Table 1), and  $F = \begin{pmatrix} fA \\ fB \\ fC \end{pmatrix} = \begin{pmatrix} 0.21 \\ 0.08 \\ 0.04 \end{pmatrix}$  the

annual fluctuation percentage matrix for the three analyzed categories, the number of

departures from the organization for each category can be determined:  
 $nd = \begin{pmatrix} ndA \\ ndB \\ ndC \end{pmatrix} = \begin{pmatrix} nA \cdot fA \\ nB \cdot fB \\ nC \cdot fC \end{pmatrix} = \begin{pmatrix} 250 \cdot 0.21 \\ 75 \cdot 0.08 \\ 70 \cdot 0.04 \end{pmatrix} = \begin{pmatrix} 53 \\ 6 \\ 3 \end{pmatrix}$ , the total movements caused by these  
 departures over a year can also be determined:

$$tM = R^t \cdot F = nA \cdot fA + nB \cdot fB + nC \cdot fC = ndA + ndB + ndC = 53 + 6 + 3 = 62 \text{ departures,}$$

where  $R^t \cdot F$  is the dot product (inner product) of the two vectors.

Following a one-year study of the movements, the following replacement matrix was constructed, expressed as a percentage:

$$M = \begin{pmatrix} iE^t \\ - \\ iC \end{pmatrix}, \text{ resulting from the combination of:}$$

- Replacements from outside (recruitments), represented by the matrix:

$$iR = \begin{pmatrix} iEA \\ iEB \\ iEC \end{pmatrix} = \begin{pmatrix} 0.6 \\ 0.5 \\ 0.4 \end{pmatrix} \text{ respectively,}$$

- inter-category replacements represented by the matrix:

$$iC = \begin{pmatrix} iA & iAB & iAC \\ iBA & iB & iBC \\ iCA & iCB & iC \end{pmatrix} = \begin{pmatrix} 0.4 & 0 & 0 \\ 0 & 0.3 & 0.4 \\ 0 & 0.2 & 0.2 \end{pmatrix},$$

where:  $iEX$  represents the percentage of staff replacements in category  $X \in \{A, B, C\}$ , with staff coming/recruited from outside ( $E$ );  $iXY$  represents the percentage of staff replacements in

category  $Y \in \{A, B, C\}$ , with staff coming from the category  $X \in \{A, B, C\}$ ;  $iX$  represents the percentage of internal staff movements from the same categorie  $X \in \{A, B, C\}$ . Therefore, it obtain:

$$M = \begin{pmatrix} 0.6 & 0.5 & 0.4 \\ 0.4 & 0 & 0 \\ 0 & 0.3 & 0.4 \\ 0 & 0.2 & 0.2 \end{pmatrix}$$

In order to determine the total number of movements caused by the 62 departures, an iterative process takes place in which, at each step, the matrix of replacements is multiplied with the matrix of staff departures until no more internal movements can be made in the categories:

*Initization*

$$np_0 = np$$

*Repeat*

$$k \leftarrow k + 1$$

$$\overline{np}_k \leftarrow M \cdot np_{k-1}$$

$$np_k \leftarrow pr(\overline{np}_k)$$

While  $\|np_k\| \neq 0$

### Remarks:

1. The algorithm stops when there are no more internal movements, i.e. the  $np_i$  matrix is the null matrix (all its elements are zeroes).
2. The  $pr(\cdot)$  function is the projection function, which from the extended matrix of movements of personnel extracts only the internal movement matrix (excluding

recruitments), that is:  $pr \begin{pmatrix} iE_k \\ iA_k \\ iB_k \\ iC_k \end{pmatrix} = \begin{pmatrix} iA_k \\ iB_k \\ iC_k \end{pmatrix}$

Applying the above algorithm to existing data it obtain the following succesion of steps which generats the structure of staff movements in the three cathegories:

Iteration 1

$$\overline{np}_1 = M \cdot np_0 = \begin{pmatrix} 0.6 & 0.5 & 0.4 \\ 0.4 & 0 & 0 \\ 0 & 0.3 & 0.4 \\ 0 & 0.2 & 0.2 \end{pmatrix} \cdot \begin{pmatrix} 53 \\ 6 \\ 3 \end{pmatrix} = \begin{pmatrix} 36 \\ 21 \\ 3 \\ 2 \end{pmatrix}$$

$$np_1 = pr(\overline{np}_1) = \begin{pmatrix} 21 \\ 3 \\ 2 \end{pmatrix}$$

Iteration 2

$$\overline{np}_2 = M \cdot np_1 = \begin{pmatrix} 0.6 & 0.5 & 0.4 \\ 0.4 & 0 & 0 \\ 0 & 0.3 & 0.4 \\ 0 & 0.2 & 0.2 \end{pmatrix} \cdot \begin{pmatrix} 21 \\ 3 \\ 2 \end{pmatrix} = \begin{pmatrix} 15 \\ 8 \\ 2 \\ 1 \end{pmatrix}$$

$$np_2 = pr(\overline{np}_2) = \begin{pmatrix} 8 \\ 2 \\ 1 \end{pmatrix}$$

Iteration 3

$$\overline{np}_3 = M \cdot np_2 = \begin{pmatrix} 0.6 & 0.5 & 0.4 \\ 0.4 & 0 & 0 \\ 0 & 0.3 & 0.4 \\ 0 & 0.2 & 0.2 \end{pmatrix} \cdot \begin{pmatrix} 8 \\ 2 \\ 1 \end{pmatrix} = \begin{pmatrix} 6 \\ 3 \\ 1 \\ 0 \end{pmatrix}$$

$$np_3 = \text{pr}(\overline{np}_3) = \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix}$$

Iteration 4

$$\overline{np}_4 = M \cdot np_3 = \begin{pmatrix} 0.6 & 0.5 & 0.4 \\ 0.4 & 0 & 0 \\ 0 & 0.3 & 0.4 \\ 0 & 0.2 & 0.2 \end{pmatrix} \cdot \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \\ 0 \\ 0 \end{pmatrix}$$

$$np_4 = \text{pr}(\overline{np}_4) = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

Iteration 5

$$\overline{np}_5 = M \cdot np_4 = \begin{pmatrix} 0.6 & 0.5 & 0.4 \\ 0.4 & 0 & 0 \\ 0 & 0.3 & 0.4 \\ 0 & 0.2 & 0.2 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

$$np_5 = \text{pr}(\overline{np}_5) = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \rightarrow \text{STOP}$$

It follows that the matrix that stores the structure of the movements is the following:

$$MP = \begin{pmatrix} iE_1 & iE_2 & iE_3 & iE_4 & iE_5 \\ iA_1 & iA_2 & iA_3 & iA_4 & iA_5 \\ iB_1 & iB_2 & iB_3 & iB_4 & iB_5 \\ iC_1 & iC_2 & iC_3 & iC_4 & iC_5 \end{pmatrix} = \begin{pmatrix} 36 & 15 & 6 & 2 & 1 \\ 21 & 8 & 3 & 1 & 0 \\ 3 & 2 & 1 & 0 & 0 \\ 2 & 1 & 0 & 0 & 0 \end{pmatrix}$$

By summing the elements on each line in the MP matrix, staff movements per category, including external recruitment, can be determined:

$$\begin{aligned} mpE &= \sum_{k=1}^5 iE_k = 60 \text{ external recruitment} \\ mpA &= \sum_{k=1}^5 iA_k = 33 \text{ movements per category A} \\ mpB &= \sum_{k=1}^5 iB_k = 6 \text{ movements per category B} \\ mpC &= \sum_{k=1}^5 iC_k = 3 \text{ movements per category C} \end{aligned}$$

Resulting in a total final of:  $tMP = mpE + mpA + mpB + mpC = 102$  consecutive staff movements generated by the 62 departures. Finally, with this information, it can determine:

- percentage of external fluctuation:

$$pFE = \frac{tM}{N} \cdot 100 = \frac{62}{395} \cdot 100 = 15.7 \%$$

- the percentage of global circulation:

$$pCG = \frac{tMP}{N} \cdot 100 = \frac{102}{395} \cdot 100 = 25.8 \%$$

- percentage of personnel fluctuation, per category:

$$pfpA = \frac{fpA}{nA} = \frac{npA+mpA}{nA} \cdot 100 = \frac{53+33}{250} \cdot 100 = 33.4 \%$$

$$pfpB = \frac{fpB}{nB} = \frac{npB+mpB}{nB} \cdot 100 = \frac{6+6}{75} \cdot 100 = 16 \%$$

$$pfpC = \frac{fpC}{nC} = \frac{npC+mpC}{nC} \cdot 100 = \frac{3+3}{70} \cdot 100 = 8.6 \%$$

By comparing staff departures with the staff movements it will have the following situation presented in Table 2.

**Table 2. Fluctuation of personnel**

	Category A	Category B	Category C
Departures	53	6	3
Internal Movements	33	6	3
Total	86	12	6
%	33.40	16.00	8.60

The process of recruiting, selecting and recruiting new staff involves a number of costs, such as: publishing the recruitment announcement 2,838 m.u.; cost of recruitment/selection and placement companies 140,850 m.u.; spending time resources to describe job vacancies, analysis of application files and their selection according to the criteria in the job description, application and interpretation of tests, selection interviews with candidates to make the employment decision, new employees orientation 29,230 m.u.; stationery expenses 1,860 m.u.

The recruitment and selection costs can be calculated according to the following formula:

$$cRS = \sum_{i=1}^n cRS_i$$

Through the data on the recruitment process generated by the 62 departures and the material and human resources involved resulted an average recruitment cost of:

$$cmR = \frac{cRS}{tM} = \frac{174,778}{62} = 2,819 \text{ m.u./person}$$

Reported to each category analyzed the recruitment and selection costs are as follows:

$$\begin{pmatrix} cRSA \\ cRSB \\ cRSC \end{pmatrix} = np \cdot cmR = \begin{pmatrix} npA \\ npB \\ npC \end{pmatrix} \cdot cmR = \begin{pmatrix} 53 \\ 6 \\ 3 \end{pmatrix} \cdot 2819 = \begin{pmatrix} 149,407 \\ 16,914 \\ 8,457 \end{pmatrix}$$

In addition to training on employee integration, the organization has a professional development and qualification program at their work place, which is summarized as follows:

- training courses (TC) for staff of category A (carpenters, blacksmiths, concrete masons, stonecutters, electricians, installers, welders):

$$cTC = \begin{pmatrix} cTCA \\ cTCB \\ cTCC \end{pmatrix} = \begin{pmatrix} 1,200 \\ 0 \\ 0 \end{pmatrix}$$

- training courses for development of technical skills (DTS) available to the staff in category B and category C:

$$cDTS = \begin{pmatrix} cDTSA \\ cDTSB \\ cDTSC \end{pmatrix} = \begin{pmatrix} 0 \\ 2,300 \\ 2,300 \end{pmatrix}$$

- personal development course (communication, negotiation, leadership) (DC) in category B and category C:

$$cDC = \begin{pmatrix} cDCA \\ cDCB \\ cDCC \end{pmatrix} = \begin{pmatrix} 0 \\ 3,800 \\ 3,800 \end{pmatrix}$$

- management and project management courses (MPM) for the staff in category C:

$$cMPM = \begin{pmatrix} cMPMA \\ cMPMB \\ cMPMC \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 5,600 \end{pmatrix}$$

These include basic training costs and integration:

$$cIBI = \begin{pmatrix} cIBIA \\ cIBIB \\ cIBIC \end{pmatrix} = \begin{pmatrix} 400 \\ 400 \\ 400 \end{pmatrix}$$

Starting from these training costs, it can calculate the hidden costs expressed in the form of investment loss due to outsourcing, in each category:

$$iF = \begin{pmatrix} iFA \\ iFB \\ iFC \end{pmatrix} = cIBI + cFP + cDCT + cDP + cMAP = \begin{pmatrix} 1,600 \\ 6,500 \\ 12,100 \end{pmatrix}$$

So the loss of investment for each of the three categories of employees in the analyzed organization is:

$$pi = \begin{pmatrix} piA \\ piB \\ piC \end{pmatrix} = \begin{pmatrix} npA \cdot iFA \\ npB \cdot iFB \\ npC \cdot iFC \end{pmatrix} = \begin{pmatrix} 84,800 \\ 39,000 \\ 36,300 \end{pmatrix}$$



Then, the fluctuation of personnel within the economic entity, starting from the replacement matrix is:

- Category A:

$$\bullet \quad fpA \cdot \begin{pmatrix} iEA \\ iA \\ iBA \\ iCA \end{pmatrix} = (npA + mpA) \cdot \begin{pmatrix} iEA \\ iA \\ iBA \\ iCA \end{pmatrix} = 86 \cdot \begin{pmatrix} 0.6 \\ 0.4 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 52 \\ 34 \\ 0 \\ 0 \end{pmatrix} \begin{array}{l} \text{new entry} \\ \text{movements in Cat. A} \\ \\ \end{array}$$

- Category B:

$$\bullet \quad fpB \cdot \begin{pmatrix} iEB \\ iAB \\ iB \\ iCB \end{pmatrix} = (npB + mpB) \cdot \begin{pmatrix} iEB \\ iAB \\ iB \\ iCB \end{pmatrix} = 12 \cdot \begin{pmatrix} 0.5 \\ 0 \\ 0.3 \\ 0.2 \end{pmatrix} = \begin{pmatrix} 6 \\ 0 \\ 4 \\ 2 \end{pmatrix} \begin{array}{l} \text{new entry} \\ \\ \text{movements in Cat. B} \\ \text{movements by Cat. C in B} \end{array}$$

- Category C:

$$\bullet \quad fpC \cdot \begin{pmatrix} iEC \\ iAC \\ iBC \\ iC \end{pmatrix} = (npC + mpC) \cdot \begin{pmatrix} iEC \\ iAC \\ iBC \\ iC \end{pmatrix} = 6 \cdot \begin{pmatrix} 0.4 \\ 0 \\ 0.4 \\ 0.2 \end{pmatrix} = \begin{pmatrix} 2 \\ 0 \\ 1 \\ 2 \end{pmatrix} \begin{array}{l} \text{new entry} \\ \\ \text{movements by Cat. B in C} \\ \text{internal movements in Cat. C} \end{array}$$

Summarizing, hidden costs generated by staff fluctuations on the example shown, are presented in Table 3.

**Table 3. Hidden costs generated by staff fluctuations**

Categories / Costs	Investment loss (m.u.)	Training costs (m.u.)	Total (m.u.)
Category A	84,800	83,200	168,000
Category B	39,000	16,200	55,200
Category C	36,300	6,000	42,300

To these hidden costs generated by the loss of investment due to the courses followed by the staff leaving the organization and the new employees, the entire recruitment process (making and publishing ads, interviews, personal selection, etc.), it can add the over-wages offered the employees who took over the tasks of the 62 employees, overtime over the period in which the posts remained vacant. According to the salary scale provided by the Human Resources department, the average salary for each analyzed employee category is shown in the table below, as follows: Employees who left the economic entity on the one hand and those newcomers on the other.

The NORIA effect measures the replacement effect in the same posture of employees with a longer seniority by young employees. The latter generally receive lower salaries, which allow the organization to reduce its costs. In calculating the NORIA effect for new employees, it will calculate the salary differences for each category analyzed over a year (Table 4).

**Table 4. Variation in wage cost as a result of employees' seniority variation**

Salaries Categories	Average salary for staff leaving the organization	Average salary for the new employee	Average salary difference	Cost change per 1 year
Category A	4,700 m.u.	4,500 m.u.	200 m.u.	2,400 m.u.
Category B	7,950 m.u.	7,880 m.u.	70 m.u.	840 m.u.
Category C	11,020 m.u.	10,940 m.u.	80 m.u.	960 m.u.

The NORIA effect of applies to all movements except for movements within the same category, in this sense it will has: CATEGORY A:  $2,400 \text{ m.u.} \times (86 \times 60\%) = 123,840 \text{ m.u.}$ ; CATEGORY B:  $840 \text{ m.u.} \times (12 \times 70\%) = 7,056 \text{ m.u.}$ ; CATEGORY C:  $960 \text{ m.u.} \times (6 \times 80\%) = 4,608 \text{ m.u.}$  To determine the overall cost of personnel fluctuation on the three categories, the following situation is drawn:

**Table 5. The hidden cost generated by personnel fluctuations**

	Fluctuation (%)	Number of departures	Recruiting Cost	Training Cost	NORIA Effect	Total	Unitary Hidden Cost
	1	2	3	4	5	$6=3+4-5$	$7=6/2$
Category A	21%	53	149,407	168,000	123,840	193,567	3,652
Category B	8%	6	16,914	55,200	7,056	65,058	10,843
Category C	4%	3	8,457	42,300	4,608	46,149	15,383
Total	33%	62	174,778	265,500	135,504	304,774	4,916

A high share of this phenomenon also involves other hidden costs, such as costs generated by productivity losses due to anomalies in the organization's production stream. By taking over the tasks of the remaining employees there is a subdimension in the performance of the activities, which leads to a decrease in their performance. At the same time, the period of integration of new employees, i.e. the period of accommodation and taking over of new tasks, generates hidden adaptation costs. Following an analysis based on the interviewing of the staff leaving the organization, a series of information was gathered on the reasons that triggered this malfunction.

#### 4. CONCLUSIONS

Malfunctions are the starting point of hidden costs and can be defined as disruptions or abnormalities that affect the organization's operation, and their monetary transposition is given by hidden costs. When an economic entity manages to significantly reduce their dysfunctions, the financial performance is inevitably improved. However, this performance achieved by diminishing hidden costs is not reflected separately in accounting, as it is a hidden performance. The costs generated between the departure of a person and the arrivals of his successor are costs supported by the organization. This period of time creates malfunctions, hence hidden costs (for example, diminishing productivity, impact on motivation, loss of time of the human resources and manager department, loss of opportunity).

In conclusion, identification and measurement of malfunctions through interviews, indicators and monitoring reports allow hidden costs to be managed. In the present paper it note that the use of mathematical methods is very important in economic practice, so based on

a mathematical algorithm it obtain a sequence of iterations which leads us to identify fluctuations of personnel and to evaluated the hidden costs.

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