ORIGINAL PAPER

USING MARKOV CHAINS TO FORECAST SOCIAL DYSFUNCTIONS AND IMPROVE INDIVIDUAL AND ORGANIZATIONAL PERFORMANCE

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Abstract. *Social dysfunctions are appearing inevitably in any organization, but if they are continuously monitored and controlled by the human resources specialists and managers, then these specialists may correct the gap between the obtained results and the proposed performance. To make these corrections are necessary some simulation techniques. In this article we propose to forecast social dysfunctions by diminishing these gaps or eliminate them using simulation and mathematical modeling based on prediction (Markov chains) and on use of IT programs (MATLAB and Excel).*

Keywords: *employees' fluctuation and absenteeism, work conflicts, work accidents, Markov chains, performance.*

1. INTRODUCTION

Social dysfunctions are inevitabily for any organization, but the managers if they want to find a way to solve them, first they have to detain those skills necessary to discover them on time and to develop strategies in order to diminish their influence on organization performance [39]. Excessive absenteeism, work conflicts, movement of human capital and work accidents are costly for any organization, so in the best interest of the organization is to identify, monitor, and manage when they are excessive. Thus, data about absences, fluctuation, conflicts and work accidents could be used as an active surveillance mechanism to identify a social dysfunction disorder in order to diminish their influence on individual and organizational performance and as indicators that can measure the organization performance [6]. All these social dysfunctions generate costs that affect organizational and individual performance on medium and long term (lower motivation, retention, productivity and commitment) [38] and management is directly responsible to ensure secure and healthy conditions [10]. To reduce the impact could have these dysfunctions on performance is necessary to predict the future trend, using effective communication processes, building trust and credibility among employees [9], using survey feedback [7] or simulation and modeling techniques based on stochastic equations [8].

In this article we will describe each type of social dysfunction present in organizations, such as employees movements or fluctuations, absenteeism, work conflicts and work accidents and we will use Markov chains calculation. We are also develop a model

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necessary for each type of social dysfunction in order to show the importance of using Markov chains in predicting the future trends of these dysfunctions in order to diminish in time their impact on individual and organization performance. Degradation of work conditions lead to increased number of social dysfunctions [8], thus, the organization must have the ability to efficiently manage them, representing a critical skill. Despite the fact that many managers want to avoid them, they are investing time and money in mitigating conflicts and improving work relations, being an important activity which add value [32].

2. MATERIALS AND METHODS

2.1. MATERIALS

In this chapter we present the literature made in the field and analyse the four components of social dysfunctions present in organizations which could have an impact on individual and organizational peroformance.

Employees' fluctuation and its impact on organization performance

No individual likes to leave an organization where he/she is treated well [41]. Without respect, loyalty, trust and commitment, communication, implication, satisfaction and happyness, job rotation, etc. an employee will not stay long, that is why organizations must offer effective HR policies. The employees if are not motivated they will not stay with organization, they will fluctuate and they will lose their productivity, innovation and efficiency in work teams. The retention of employees is significant for achieving organizations goals and objectives [41].

We will show some of the most important reasons that employees are leaving from organizations, why they are fluctuating along years:

- Expectations about workplace are not met [2];
- The match between emolyees skills and job requirements is not good;
- Lack of communication or feedback with different stakeholders [39];
- Lack of training (coaching or mentoring);
- Lack of recognition;
- Lack of the balance between personal and professional life;
- Lack of employers confidence or trust;
- Lack of conviviality and appearance of social dysfunctions.

Employees leaving influence the employees who are remaining in organizations, by creating rumors and perceived reasons (like dissatisfaction), creating negative influence on performance [21]. Thus, starting from this point (knowing the employees leaving reasons) is important to develop a first critical step in creating long-term retention solutions by applying some effective retaining measures:

- Improve relationships with colleagues and managers [10];
- Clear communication of organization vision and mission by developing a workable plan and possess the necessary competence to achieve it) [46];
- Keep their promises by following up words with actions;
- Empower the work force by giving them trust and confidence;
- Reward high-performing employees with extra development opportunities;
- Train the employees on how business work;

- Focus attention on organizational performance by creating variable incentives or bonuses based on metrics;
- Communicate performance metrics results to line managers and HR specialists,

To find out the issues they leave the company, the former employyes must be asked for the reasons and the solution is to eliminate the factors who determined the apparition of such of situation [10]. Fluctuation of employees implies many costs as specific departure costs: a lower level of productivity or when the employee who has left may join a rival enterprise, the organization has to do with the cost of opportunity which is lost in the favor of competition.

Sometimes the employees' fluctuation may bring some *advantages* [29]:

- it favors the new skills acquisition in relation to the organization needs;
- it assures a continuous flow of new able employees;
- it externalizes promotions: in the enterprises that can propose only unqualified jobs, departures are the only possibility of benefiting of the promotion that the enterprise cannot provide.

Absenteeism and its influence on results

The study of absenteeism is important for both theoretical and practical reasons. From theoretical view absenteeism is a way of employees withdrawing from their jobs and from practical view absenteeism is very costly to many organizations. Absenteeism is a counterproductive work behavior and could be a reaction to a high level of job dissatisfaction [15], being a problem for organizations [34] and a challenge for managers [18]. Absenteeism affects team spirit and work implication [33], being a serious problems increasingly affecting developed societies, causing damage in the economic sphere [17]. It is known that absenteeism has a quite low level and is not a common problem, except for some specific sectors or some specific periods of the year [11]. Although there is a great variation of the number of absences, the experts agree that an annual percentage of absenteeism under 5% is low; over 15%, absenteeism can be considered as high. All the organizations should maintain a realistic standard for absenteeism of less than 5% [27].

The factors acting on absenteeism are [11], [34]:

1. Individual factors - age, experience, revenue, marital status, health condition, resistance to diseases, fatigue, work in shifts;
2. Organizational factors - satisfaction and motivation at work, work conditions, supervision, control, leadership style, stuffy policies, lesser involvement in the organizational activity;
3. Environmental factors - colds, viruses existing in the environment, atmospheric conditions, noise, stress, strong smells, strong light, excessive heat/cold;
4. Administrative factors - categories of personnel used in managing absences, aggregation level of the data on absenteeism – on days, weeks, work groups, shifts, organization, etc.

Absence data are organizational information routinely collected and reviewed in performance management [43]. Internal organization performance and outcomes can provide a method to assess and evaluate health leadership. Root causes for absenteeism [16]: poor work conditions, lack of clarity of responsibilities, mistreatment, inequitable application of rewards and punishment, decision inconsistency, lack of perceived appreciation, less competitive payment. Absenteeism is critically expensive; according to a survey of SHRM, the main causes of absenteeism are physical health, stress, and demotivation. Many organization reduced absenteeism by using flexible scheduling, leave for school functions, and employee assistance programs [37].

Work conflicts

Rapid pace of business, increased competition, and diversity in the workplace, flattened organizational structures has braught new challenges for employees but also for the organization [25]. People involved in work conflicts like to talk about it inside and outside the organization. Behavioral responses to conflict can be classified as direct, indirect, or uncontrollable (Table 1).

Table 1 Common behavioral response to work conflicts [25]

Direct	Indirect	Uncontrollable intensity
Discuss face-to-face with the involved emoloyees, Listen the both involved parties, Try to convince the employees, Try to change their aggressive behavior.	Avoid those cases, Disscuss with their colleagues, Disscuss with other employees outside organization, Talk behind the persons back.	Show tension non-verbally, Cry.

Conflict supposes a disagreement or an incompatible behavior between the parties involved, perceived even by them [40].

Conflict is inevitable, but most people find it unpleasant, and may take on different forms:

1. after the psychological implication [25]:
   a). affective conflicts (happyness, joy, emotions, etc);
   b). destructive conflicts (insults, ego attacks, inflexibility, negative emotions, tension).
2. after the level where it take place [5]:
   a). intrapersonal conflicts- refer to the position of an individual in relation to himself;
   b). interpersonal conflicts- disagreements, incompatibilities between employees and superiors, misunderstandings, disturbances. It can be interpersonal (it takes place between two or more people;
   c). organizational- between two or more individuals, between two or more groups [30];
   d). collective conflicts- oppose the defined categories or social classes depending on their relation to the production.
3. after the period it take place:
   a). occasionally;
   b). permanent. If the conflict is permanent, a negotiation is necessary. A particular form of permanent conflict is the *strike* which is a collective ceasing of work, in order to make some professional claims against authorities [12]. The phenomenon is not always collective and the claims could go beyond the classical professional framework and need to be seen in a broader view.

Work accidents

Work accidents are sudden and sometimes violent events occuring during the work, leading to health damage of worker life [24]. Workplace accidents are the most visible manifestation of the hazards of paid work. Most work accidents are non-fatal. In everyday life may occur minor problems which affect work attendance [44].

Accidents which affect the employees can have four types of causes [26]:

- products exintency with a high degree of danger;
- using unproper the machines and the equipments;

- making unproper the task of proction process;
- activity of employees, which are not depending of the factors mentioned below.

Many factors affect safety of employees and human error and workplace conditions are the factors responsible for most of the accidents.
These factors may be:
- individual factors: drug, alcohol, health, cognitive ability, fatigue, work experience, age, job insecurity, job involvement, motivation, training, skill, personality characteristics;
- organizational factors: type of industry, companys safety policies, work hours, allocation of tasks, the quality of maintainance and repair, unware employees of hazards, lack of adequate work procedures, lack of supervision, monitoring, control and training [13], [14], incompatible goals, poor planning, rules, communication faylure, poor procedures [31];
- ergonomic factors: lightning, temperature, equipment design, work pressure [35].

2.2. METHODS

About Markov chains and their use in human resources management

Modelling the short-term dynamics of real economic phenomenon is paramount to economic policy [1]; using models help determine the impact could have some variables on a dependent variable and show its usefulness [28]. Among these models we remind Markov chains which is a sequence of random variables, and correspond to the states of a certain system in such a way that the state at one time depends only on the state in the previous time. Markov is particulaly remembered for his study of Markov chains, which use stochastic processes with a lot of applications [4].
Markov chains are a mathematical method used in human resources planning and forecasting, and allows analysis of [3], [42]:

- movement in specific categories of employees on the basis of variables as salary, age, and sex;
- track employee movement to identify patterns of promotion and/or later the mobility between positions as well as movement in and out of the organization or function;
- determine working patterns: balance of full-time and part-time workers, overtime, short-term contracts, over time working hours, job shrinking, remote working;
- analyse organization structure and development: workforce size and structure;
- determine workforce diversity: monitoring of current and prospective employees, equal opportunities and diversities policies, awareness training;
- analyse pay and reward: mix of financial and non-financial rewards, use of contingent pay, market position;
- analyse performance management: type of performance appraisal, links to reward, attendance management;
- analyse employee retention: family friendly policies, terms and conditions, employee development;
- determine training and development efficiency: induction, training programs, development reviews, education;
- analyse employment relations: union recognition, communication, grievance and disciplinary policies;
- analyse release policies: natural westage, redundancy programs, outplacement support.

Forecasting is the key stage of traditional human resource planning, by combinating quantitative and qualitative methods to determine the organization future requirements and the availability of human resources [3].

To forecast HR activities, organizations may use [20], [23]:

- Quantitative techniques (statistical procedures as linear regression analysis, ratio analysis or Markovian analysis);
- Qualitative or judgemental techniques (Delphi techniques, executive techniques, succession techniques, nominal group technique and vacancy analysis);

Markovian analysis represents another quantitative technique for forecasting employee supply which provides HR specialists with information that can be used to guide action to achieve the strategic objectives of the system, to develop performant policies, to overcome risks, to predict some negative changes.

Forecasting continuous workforce demand or future requirements has always been a difficult process in organizations [22]. A variety of techniques have been employed in attempting to forecast what a current organizational workforce will resemble x years hence, the key was to predict the future trends using Markov chains.

Using Markov chains to predict future trend of social dysfunctions

Forecasting consists of making predictions based upon the observed regularities of the past. Workforce requirements appear from organizational development and from the internal changes: fluctuation and movement of the employees (transfer, promotion, job rotation, voluntary retirement, resignation, dismissal, discharge or death), work accidents or work conflicts. The forecast process involves the use of matrices for various occupational groups or work units correlating variables as age, sex, length of time of service, etc. To forecast workforce is difficult and need little help to management in planning for the supply of different categories of employees with different levels of skills for different types of jobs [20].

Necessary steps for Markov chain implementation

A Markov chain has N states designated 1, 2, ..., N (and N is a finite integer).The states of the chain, observed as equally spaced points, are called epochs, denoted by n, n= 0, 1, 2... Epoch n designates the end of time period n, which is also the begining of period n+1. The random variable Xn represents the state of the chain at epoch n. A Markov chain is an indexed sequence of random variables, $\{X_0, X_1, X_2, \ldots\}$, which has the Markov property: a transition probability depends only on the present state of the process. If at epoch n the chain is in state i, then $X_n = i$. The probability that the chain is in state i at epoch n, which may represent the present epoch, is denoted by $P(X_n = i)$ [36].

The steps for implementing Markov chains are [19], [36]:

1. It is build the tranzit matrix of probabilities; the sum of its elements is 1. Each row of P represents the presnt state, at epoch n. Each column represents the next state, at epoch n+1. Since the probability of a transition is conditioned on the present state, the entries in every row of P sum to one. Then the probability that the chain is in state j at epoch n+1, the next epoch, is denoted by $p(X_{n+1}=j)$. The conditional probability is called the transition probability ($p_{ij}=P(X_{n+1}=j/X_n= i)$.

$$P = \begin{array}{c|cccccc} X_n/X_{n+1} & 1 & 2 & 3 & \ldots & m \\ 1 & p_{11} & p_{12} & p_{13} & \ldots & p_{1m} \\ 2 & p_{21} & p_{22} & p_{23} & \ldots & p_{2m} \\ 3 & p_{31} & p_{32} & p_{33} & \ldots & p_{3m} \\ . & . & . & . & \ldots & . \\ n & p_{n1} & p_{n2} & p_{n3} & \ldots & p_{nm} \end{array} \quad (1)$$

where, $p_{11}+p_{12}+p_{13}+\ldots+p_{1m}=1$ (2)

2. It is written the initial distribution as a line vector, with elements formed from the weighths of processes considered the time "0". A Markov chain evolves over time as it moves from state to state in accordance with its transition proabilities (Fig. 1).

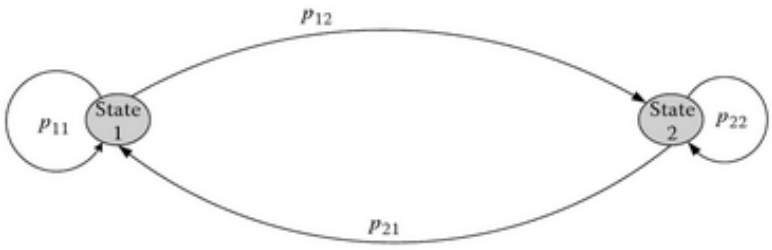

Figure 1. Transition probability graph for a two-state Markov chain [36].

3. By multiplying the initial distribution with the probabilities matrix we obtain the wight of process for the time "1";
4. Thus, we determine the weights for all the times we want to predict the values for the times we want "2", "3", "4", ..., "n"; the simple arithmetical calculations using stochastic process are repeated for each analysed category for successive periods [45].
5. It is made the evolution of the predicted times for the analysed processes;
6. It is made the grapfical representation for every process;
7. It is presented the initial time and the next times, establishing startegies and policies for the analysed processes according to the predicted results, taking into consideration the competition or the economical/technical conditions from organizations.

Research methodology

The main objective of this research is to analyse the trend of social dysfunctions using Markov chains, MATLAB and Excel.

Our presented example is a simple but effective way necessary to forecast personnel changes using Markov chains in order to improve individual and organizational performance. Some data from an institution who is offering services was registred about its social dysfunction at the end of the November of 2017.

Using Markov chains to forecast employees' fluctuation

According to this data we obtained the following employees table according to two factors: years of work experience and age (Table 2).

Table 2. Repartition of employees according to fluctuation.

Work experience/Age	<29 years	30-44 years	45-59 years	>60 years	Total
0-5	1(1twc)	1(1rsg)	0	0	2
6-10	0	1(1rsg)	2(2rsg)	0	3
11-20	0	1(1twc)	4(4rsg)	0	5
>21	0	0	3(3rsg)	7(6 rtr, 1sks)	10
Total	1	3	9	7	20

As we may see, there are 20 cases of employees' fluctuation: 11 resignations (rsg), 2 termination work contract (twc), 6 retirements (rtr), and 1 for seakness (sks) divided on each analysed category. Thus we can build the vector necessary for Markov chain calculation, (11/20 2/20 6/20 1/20), becoming V1= (0,55 0,10 0,30 0,05).

Thus, from the table above results the following matrix:

$$A_1 = \begin{bmatrix} 1/2 & 1/2 & 0 & 0 \\ 0 & 1/3 & 2/3 & 0 \\ 0 & 1/5 & 4/5 & 0 \\ 0 & 0 & 3/10 & 7/10 \end{bmatrix} \quad (3)$$

We also build the transactional matrix for estimating internal movement of employees. Making the calculation, we obtained the following tranzition matrix (A_{1t}), necessary for Markov chain calculation:

$$A_{1t} = \begin{bmatrix} 0,5 & 0,5 & 0 & 0 \\ 0 & 0,33 & 0,67 & 0 \\ 0 & 0,2 & 0,8 & 0 \\ 0 & 0 & 0,3 & 0,7 \end{bmatrix} \quad (4)$$

Using Markov chains calcultions, we will determine how can be the trend for employees' fluctuation in the next 6 months, information necessary for making external recruitment plans, changing managers behavior and communication policies.

Thus, using MATLAB we will multiply the probabilities of tranzition matrix (A_{1t}) with the determined vector, V1= (0,55 0,10 0,30 0,05), are obtained for the next six months the following predicted data for Jan-June 2018.

$$Dec = (0,2750\ 0,3680\ 0,3220\ 0,0350) \quad (5)$$
$$Jan = (0,1375\ 0,3233\ 0,5147\ 0,0245)$$
$$\text{Feb}=(0,0688\ 0,2784\ 0,6357\ 0,0171)$$
$$Mar = (0,0344\ 0,2534\ 0,7002\ 0,0120)$$
$$\text{Apr}=(0,0172\ 0,2409\ 0,7336\ 0,0084)$$
$$\text{May}=(0,0086\ 0,2348\ 0,7507\ 0,0059)$$

The predicted values for employees' fluctuation, using MATLAB, for the next six months are presented in Table 3.

Table 3. The trend of employees fluctuation/work experience .

Evolution of fluctuation/experience	Nov 2017	Dec 2017	Jan 2018	Feb 2018	March 2018	Apr 2018	May 2018
0-5	55%	27,50%	13,75%	6,88%	3,44%	1,72%	0,86%
6-10	10%	36,80%	32,33%	27,84%	25,34%	24,09%	23,48%
11-20	30%	32,20%	51,47%	63,57%	70,02%	73,36%	75,07%
>21	5%	3,50%	2,45%	1,71%	1,20%	0,84%	0,59%

The trend for employees' fluctuation is presented in Fig. 2.

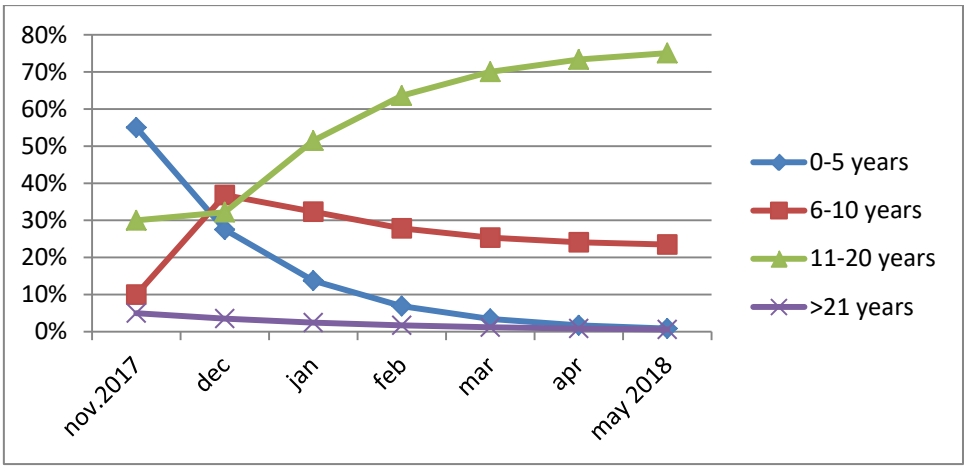

Figure 2. Graphical representation of employees' fluctuation upon ages.

It may be observed in Fig. 2 that the fluctuation is predicted to increase for employees with 0-5 years of work experience and for those with an experience of 6-10 years will have a short increase and then a decrease in the next 5 months. For employees with an experience between 11-20 years the fluctuation will know a vertiginous increase for the next analysed period, due to their departing in other organizations who offer better work condition, such as financial motivation. Organization, to overcome the fluctuation of employees with more experience, may implement more effective programs to increase commitment, fidelity, trust, satisfaction and motivation, be it financial or non-financial, and to retain talented staff, with knowledge. Also, if they observe from time this fluctuation, the organization could predict and organize an effective recruitment, selection, employment and integration program, to overcome future costs and improve the efficiency of these teams, in order to bring the right employee at the right time.

Using Markov chains to forecast employees' conflicts

According to the registred data regarding the employees work conflicts we obtained the following employees table according to two factors: education level and sex (Table 4).

Table 4 Repartition of employees according to employees conflicts

Sex/Education level	High school	Univeristy	Total
Male	10 (2 IC, 8 OC)	4 (1 IC, 3 OC)	14
Female	6 (4 IC, 2 OC)	2 (2 IC)	8
Total	16	6	22

As we may see, there are 22 employees' conflicts, from them being 9 individual conflicts (IC) and 13 organizational conflicts (OC). Thus, we can build the vector necessary for Markov chain calculation: (9/22 13/22), becoming V2= (0,41 0,59)

We also build the transactional matrix for estimating internal conflicts of employees.

$$A2 = \begin{bmatrix} \frac{10}{14} & \frac{4}{14} \\ \frac{6}{8} & \frac{2}{8} \end{bmatrix} \quad (6)$$

$$A2t = \begin{bmatrix} 0,71 & 0,29 \\ 0,75 & 0,25 \end{bmatrix} \quad (7)$$

Using MATLAB we obtain the following predicted data which are presented in Table 5:

$$\text{Dec} = (0{,}7336\ \ 0{,}2664) \tag{8}$$

Jan=(0,7207 0,2793)
Feb=(0,7212 0,2788)
Mar=(0,7212 0,2788)
Apr=(0,7212 0,2788)
May=(0,7212 0,2788)

Table 5 The trend of employees conflicts/sex

Evolution of conflicts/sex	Nov 2017	Dec 2017	Jan 2018	Feb 2018	March 2018	Apr 2018	May 2018
Male	41%	73,36%	72,07%	72,12%	72,12%	72,12%	72,12%
Female	59%	26,64%	27,93%	27,88%	27,88%	27,88%	27,88%

The trend is represented graphically to observe the change in the next period (Fig. 3).

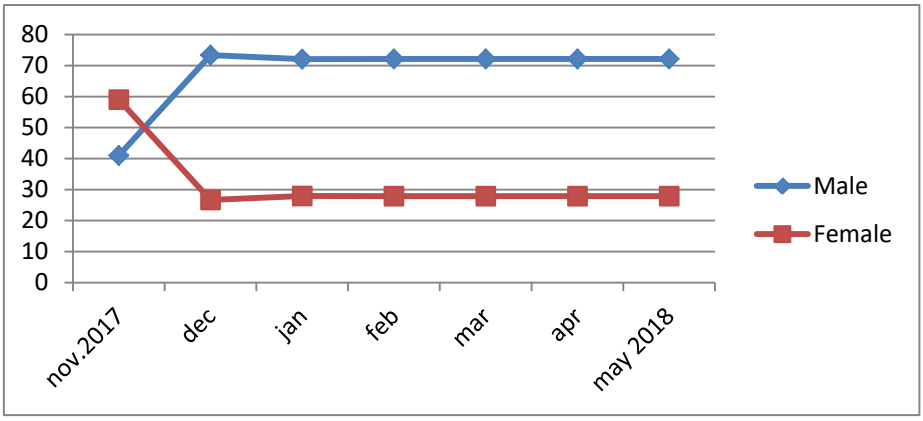

Figure 3. Grapfical representation of employees conflicts upon sex.

We may observe from the Fig. 3 that employees' conflicts will know an increase for male employees, surpassing the initial value for female conflicts, and registering a continuous increasing for the analysed period. This could mean for organization to develop a special program based on cooperation, collaboration, communication, working in teams, approaching diversity to overcome these predicted conflicts.

Using Markov chains to forecast employees work accidents

According to the registred data regarding the employees work accidents we obtained the following employees table according to two factors: experience in organization and days lost of work due to work accidents (Table 6).

Table 6. Repartition of employees according to work accidents.

Experience in org/days lost of work	<4	5-9	10-14	>15	Total
0-4,11	2 (he)	1(uue)	1(uue)	0	4
5-9,11	1(uep)	1(he)	0	1(uep)	3
10-14,11	0	1(uue)	0	0	1
>15	1(p)	0	2(uue)	1(uue)	4
Total	4	3	3	2	12

As we may see, from the 12 cases of employees' conflicts, there is 1 accident produced by the products with high degree of risk (p), 6 cases of accidents due to unproper usage of equipment (uue), 2 accidents due to unproper execution of processes (uep) and 3 accidents due to human errors (he). Thus, we can build the vector necessary for Markov chain calculation: (1/12 6/12 2/12 3/12), becoming V3= (0,08 0,5 0,17 0,25)

We also build the transactional matrix for estimating internal conflicts of employees.

$$A3 = \begin{bmatrix} 2/4 & 1/4 & 1/4 & 0 \\ 1/3 & 1/3 & 0 & 1/3 \\ 0 & 1 & 0 & 0 \\ 1/4 & 0 & 2/4 & 1/4 \end{bmatrix} \quad (9)$$

$$\text{A3t}=\begin{bmatrix} 0{,}50 & 0{,}25 & 0{,}25 & 0 \\ 0{,}33 & 0{,}33 & 0 & 0{,}33 \\ 0 & 1 & 0 & 0 \\ 0{,}25 & 0 & 0{,}50 & 0{,}25 \end{bmatrix} \quad (10)$$

Using MATLAB we obtain the follwing predicted values for Jan-June 2018 which are presented in Table 7.

$$Dec = (0{,}2675\ \ 0{,}3550\ \ 0{,}1450\ \ 0{,}2325) \quad (11)$$

Jan=(0,3090 0,3290 0,1831 0,1788)

$$Feb = (0{,}3078\ \ 0{,}3690\ \ 0{,}1667\ \ 0{,}1566)$$

Mar=(0,3148 0,3654 0,1552 0,1646)

Apr=(0,3191 0,3545 0,1610 0,1654)

May=(0,3179 0,3578 0,1625 0,1619)

Table 7. The trend of work accidents/ experience.

Evolution of work accidents/experience	Nov 2017	Dec 2017	Jan 2018	Feb 2018	March 2018	Apr 2018	May 2018
0-4,11	8%	26,75%	30,90%	30,78%	31,45%	31,91%	31,79%
5-9,11	50%	35,50%	32,90%	36,90%	36,55%	35,45%	35,77%
10-14,11	17%	14,50%	18,32%	16,66%	15,53%	16,10%	16,25%
>15	25%	23,25%	17,88%	15,66%	16,47%	16,54%	16,19%

The evolution of work accidents is presented below to observe the trend for the next year (Fig. 4).

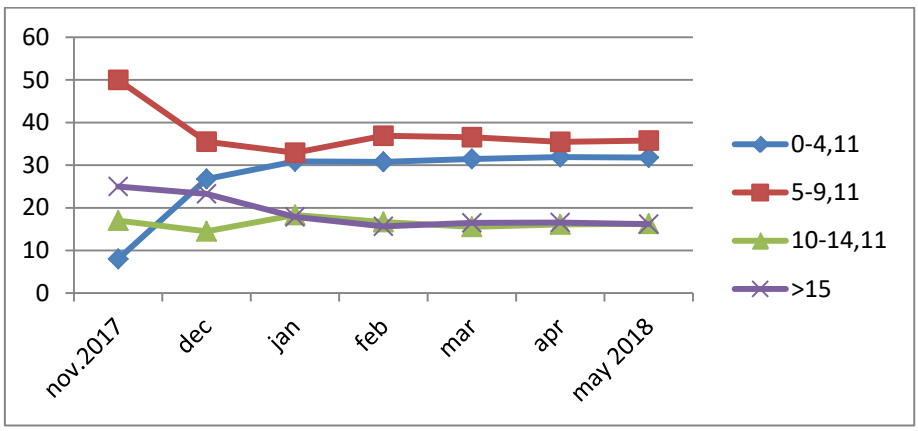

Figure 4. The trend of work accidents/experience.

As may see from the Fig. 4, work accidents will know a decrease for three from the four analysed cases. Just for the employees with the experience between 0-4,11 years the prediction will know an increasing from 8% to 31,79%, due to the fact that the young employees are more open to new jobs, challenges and bigger salaries. To overcome these issue, the organization may implement some human resources policies which can be based on offering paid training programs, be on-the-job or off-the-job, because it have been many studies and the young employees are prefering paid training programs and team work instead of bigger salaries.

Using Markov chains to forecast employees' absenteeism

According to the registred data regarding the absenteeism of employees it was obtained the following employees table according to two factors: salaries and age of employees (Table 8).

Table 8. Repartition of employees according to absenteeism

Salary/age	<29 years	30-44 years	45-59 years	>60 years	Total
<1500 RON	5(4pn, 1nap)	3(3pn)	0	0	8
1501-2500 RON	7(2pn, 2fp, 2hps, 1nap)	6(4fp, 2pn)	5(1hps, 2pn, 2fp)	2(2pn)	20
2501-3500 RON	2(2hps)	5(4pn, 1hps)	3(3pn)	1(1fp)	11
>3501 RON	4(3hps, 1pn)	3(3hp)	1(1hps)	0	8
Total	18	17	9	3	47

As we may see, there are 47 cases of abstenteeism among them being 13 cases of abseteeism due to health roblems (hps), 9 cases due to familial problems (fp), 23 cases due to personal needs (pn) and 2 cases due to non-active presence (nap). Thus we can build the vector necessary for Markov chain calculation: (13/47 9/47 23/47 2/47), becoming V4= (0,28 0,19 0,49 0,04)

We also build the transactional matrix for estimating internal conflicts of employees.

$$A4 = \begin{bmatrix} \frac{5}{8} & \frac{3}{8} & 0 & 0 \\ \frac{7}{20} & \frac{6}{20} & \frac{5}{20} & \frac{2}{20} \\ \frac{2}{11} & \frac{5}{11} & \frac{3}{11} & \frac{1}{11} \\ \frac{4}{8} & \frac{3}{8} & \frac{1}{8} & 0 \end{bmatrix} \quad (12)$$

$$A4t = \begin{bmatrix} 0,63 & 0,37 & 0 & 0 \\ 0,35 & 0,3 & 0,25 & 0,1 \\ 0,18 & 0,45 & 0,27 & 0,1 \\ 0,5 & 0,38 & 0,12 & 0 \end{bmatrix} \quad (13)$$

Using MATLAB calculations we obtained the following predicted values for the next six months and are presented in Table 9:

$$\text{Dec}=(0,4696\ \ 0,3530\ \ 0,1274\ \ 0,0500) \quad (14)$$
$$\text{Jan}=(0,4673\ \ 0,3560\ \ 0,1286\ \ 0,0481)$$
$$\text{Feb}=(0,4662\ \ 0,3559\ \ 0,1295\ \ 0,0484)$$

Mar=(0,4659 0,3559 0,1297 0,0485)
Apr=(0,4657 0,3559 0,1298 0,0486)
May=(0,4656 0,3559 0,1299 0,0486)

Table 9. The trend of absenteeism/salary .

Evolution of absenteeism/salary	Nov 2017	Dec 2017	Jan 2018	Feb 2018	March 2018	Apr 2018	May 2018
<1500 RON	28%	46,96%	46,73%	46,62%	46,59%	46,57%	46,56%
1501-2500 RON	19%	35,30%	35,60%	35,59%	35,59%	35,59%	35,59%
2501-3500 RON	49%	12,74%	12,86%	12,95%	12,97%	12,98%	12,99%
>3501 RON	4%	5%	4,81%	4,84%	4,85%	4,86%	4,86%

The representation of absenteeism is presented in the figure below (Fig. 5).

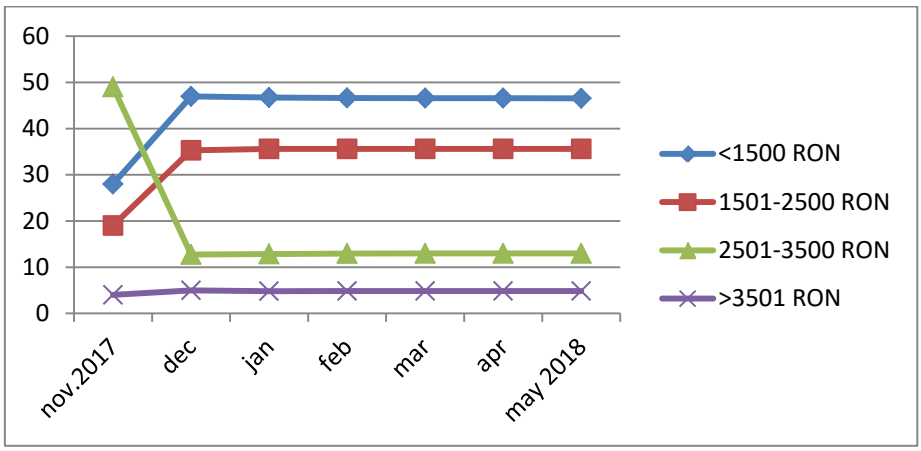

Figure 5. Graphical representation of aemployees absenteeism upon salary.

As we may see, Fig. 5 shows that predicted values for absenteeism will increase only for those employees with salaries between 1501-2500 RON and for those with less then 1501 RON. This means that those employees with bigger salaries are motivated not to be absent from the work. Thus, the organization may overcome this dysfunctionality by motivating these young employees using other forms than payments, such as: paid training programs, collaboration projects, and involvement in making decisions, scholarships, exchange relationships or job rotation.

3. RESULTS AND DISCUSSION

3.1. RESULTS

The results obtained in our research are presented above, but to overcome the social dysfunctions the analysed organization must monitor very carefully these problems and their additional costs in order to obtain performance. Thus, each element of the social dysfunctions was analysed and were proposed some good practices, which if are followed the organization may obtain performance by retaining the best employees and reduce the social dysfunctions among them:

- To overcome fluctuation of employees the analysed organization may implement more effective programs to increase commitment, fidelity, trust, satisfaction and motivation, be it financial or non-financial, and to retain talented staff, with valuable, rare and non-substitutable knowledge.
- To diminish conflicts among employees the analysed organization may develop a special program based on cooperation, collaboration, communication, working in teams, approaching diversity to overcome these predicted conflicts.
- To overcome work accidents, the organization may implement some efficient human resources policies which can be based on offering paid training programs, be on-the-job or off-the-job, because it have been many studies and the young employees are prefering paid training programs and team work instead of bigger salaries.
- The organization may overcome this dysfunctionality motivating these young employees using other forms than payments, such as: paid training programs, collaboration projects, and involvement in making decisions, scholarships, exchange relationships or job rotation.

3.2. DISCUSSION

The strength of this chapter is consisting in using simulation methods (Markov chains, regresion function and IT programs as Excel and MATLAB) in order to offer for managers and organizations a simple and cost-effective way in analysing the future impact of their actions and decisions on individual and organizational performance. Using such simulation techniques the managers can see the future trends of social dysfunctions such work conflicts, work accidents, personnel fluctuation and absenteeism and the organizations may predict future problems and may solve them in time and with minimum effort.

4. CONCLUSIONS

Thus, forecasting based on past accurate data will allow certain changes whether technological, organizational, or policy-oriented. In our case studies, analyzing absenteeism, fluctuation, work conflicts and work accidents, the magers could develop effective policies and procedures in order to overcome these social dysfunctions and to diminish future costs, to improve activities and processes as recruitment, selection, employment, and integration, to increase productivity, and especially to make them known to every employee, no matter its position/function, because an employee better informed, will bring better results and will have less social dysfunctions. Organizations will have some advantages if they are using Markov chains, because the method: is simple to implement; is representing a simplified model for real decision processes; it is easy to understand; offers an analisys and a view over the evolution of the situation in time; its results obtained are depending on the first matrix, so, developing a real and clear matrix is important, it is used to obtain predictions in differents economical fields, especially in HR such as: finding out over time the estate of social dysfunctions (problems due to absenteeism, fluctuation, work conflicts and work accidents), recruitment, motivation, etc.

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