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Organizational Wellness Modeling

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Abstract

The aim of the present paper is to establish certain mathematical models for organizational wellness as well as to create some wellness optimization problems applicable to any type of organization (including universities) that might be mathematically solved resorting to aspects of operational research of mathematical analysis. The results obtained associated with a mathematical apparatus enable one to perform analyses, comparisons, interpretations, predictions. All of us have, consciously or not, a genuine curiosity in creating and shaping organizational wellness. This concept represents a highly topical issue since professional activity, irrespective of its field, holds a very significant place for each of us. The hard-to-dinstinguish „border" between personal and professional life urges all companies, smaller or larger, to attempt to find solution at an individual and organizational level in order to support and improve the concept of organizational wellness, in its current and future understanding. Regardless of their thoughts, feelings or actions, all individuals belong to that organization.

Keywords: *organizational wellness, mathematical models, social processes modelling*

JEL classification: C13, C51, I31

1. Introduction

At an individual level, wellness can be defined as a sum of relations and situations that may occur and individual competencies may be urged in order to generate results or effects at the organizational level.

It is very important to establish some cause-effect type relations in order to define the notion of wellness, since the change of independent variable leads to changes of the dependent variable.

A positive attitude towards work will have a direct influence on the company`s performance, whereas at the individual level it represents a determining factor of professionalism. The degree of professional satisfaction (whether existing or not) has certain consequences on work efficiency, the rate of days off or job quitting, staff mobility, with direct impact on the profit targeted by the organization.

This is a concept or attitudinal variable, determined by meeting work-related expectations (that are maintained but also diversified) as well as the obtained results (professional performance). It refers particularly to people`s feelings and expectations concerning the organization they belong to and the approach to their work.

As long as an employee may learn from his own work, the human being will always look for a repetitive behavioral cycle and his commitment will increase, thus determining his dedication to the organization. The valuable results that a person may obtain in the process of work, self-evaluation and peer-evaluation of one`s work, they all determine professional satisfaction.

Any sustainable organization will be interested in the satisfaction of its employees, whereas a responsible manager is aware that organizational wellness oscillates in keeping with the quality of work conditions. Competent individuals will be faithful to the organization provided they benefit from bonuses (salary, shares) as well as appropriate working conditions and organizational policy, or promotion based on fair and equitable criteria.

In a healthy organization, with a well-defined leadership, the accomplishment and maintenance of wellness entail a nmber of positive decisions regarding lifestyle and the attainment of the spiritual, intellectual social, mental and physical potential. Irrespective of the field of activity, for the attainment of long-term success it is imperative to evince a positive outlook on life since this has a tremendous impact on the way other people interact with you. Attitude is the key to succes, since it determines the way one chooses to act. We have to be confident in our possibility to overcome our own limits and a positive attitude is the key element to success in life, which means hope, joy of life, enjoying what your are doing, smile, trust, courage, humour, optimism. It is essential to remember that **we are both the cause and the effect of our own wellness** and precisely for this reason we should act accordingly [4].

Mathematical models

The technique of mathematical modelling proves to be useful in all scientific fields. It is well known that a qualitative description of any phenomenon subject to study as well as the expression of certain laws are not enough unless they are associated with a thorough analysis of the quantitative laws governing the respective phenomenon. Therefore, we wish to measure whatever can b measured as well as to make measurable whatever has not been measured yet.

A *mathematical model* can be defined as the mathematical problem associated with any topic undergoing analysis [3]. This model is not necessarily the most accurate or the most appropriate.

The study of dynamic systems, for instance, shows that the fundamental component of a mathematical model of any dynamic process (economic, educational, social, biological, chemical, etc) represents a set of equations connecting the variables and parameters that describe the state of the particular system or a purpose function, on the variables subject to limitations (restrictions).

In the process of selecting variables the researcher will always make a compromise between the complexity of the system and the manner of objective representation of the features considered essential to its analyses. The role of the parameters is to represent the control mechanism of the process as well as to adjust the model curve for experimental data.

In a dynamic process, the time variable, *t,* is always included, implicitly or explicitly. In this context, we can distinguish:

- short-term or long-term behaviour models;
- continuous or discreet models;
- the lack or presence of delayed effects in certain models [2].

Mathematical models are the result of an interdisciplinary study, performed continuously and consistently. There is no general method of drawing up a mathematical model.

The present mathematical model aims to generate an innovation model that might lead to hierarchy and which can also justify the choice of the indicators defining the innovative process.

2. Special case: social processes modelling

Modelling focused on social processes, social indicators and, implicitly, organizational wellness, requires special attention and has particular characteristics unlike modelling of other processes or indicators, because of the difficulties triggered by the measurement of qualitative social indicators.

The fundamental characteristic of social indicators resides precisely in the fact that the object of knowledge is the subject, i.e. consicence bearer.

A study of the attitude towards work and organizational wellness will help the researcher identify or design the indicators that enable their quantitative expression.

Therefore, the major issue of mathematical modelling is an appropriate selection of qualitative indicators and their processing by means of non-parametric statistics (highlighting associations), drawing up a more complex apparatus for social statistics that takes into account the particularities of social phenomena, improvement of correlational analysis and factorial analysis.

We consider that the researcher should possess accurate and thorough knowledge of the socio-economic and environmental characteristics of the area where the social process subject to study is operational, or of the industrial organization whose wellness is subject to evaluation. In the absence of such information, all mathematical models and accurate methodology for the study of specific phenomena will remain incomplete [1].

How stable, though, are the social indicators and their impact on the development of an industrial organization? Here is a question to which the present paper has provided an answer which is going to determine the perspectives and limitations of measuring organizational wellness.

We believe that accurate research is defined not only as a quantitative expression of basic variables (i.e. measurement) but also a standardized description, subject to a single interpretation (i.e. mathematical) of the causal-functional connections among the elements of the social component undergoing research.

Social component modelling requires the measurement of various social indicators, both qualitative and quantitative, identifying the relations among them and summing up the information they carry. In a more general sense, social processes modelling as well as the other two components of the sustainable development of an industrial organization, means the reflection of reality as determined sets of symbols, signs, judgments, etc.

The most important problem of modelling is to make existing qualitative representations about social phenomena official. The structure of an industrial organization, headcount, personality structure, human interaction, social norms, etc. all these may be theoretically described by means of a formal language. This process of designing a „scientific language" will do away with a number of ambiguous notions still present in contemporary literature, will help clarify the interpretation of experience and experiment, will create a basis for further deepening of core aspects of the sustainable development research. The following significant and „active" issue is to provide proper description of various industrial organizations, i.e. a hierarchy, and a comparative approach includes the social component values of the sustainable development function.

The process of mathematical transformation of the social component requires the solving of two additional problems and simultaneously different: identification of correlation dependencies, for building up multifactorial models and studying the optimal criteria of employee activity in an industrial organization.

Mention should also be made that the study of social indicators by means of mathematical models is currently confronted with some obstacles that might be accounted by: insufficient development of sociological research, limited scale, restricted problematics; poor theoretical perspectives of many sociological problems; lack of necessary coordination of the efforts of sociologists, economists, demographers, psychologists, mathematicians, cyberneticians, logicians etc; poor knowledge by sociologists of the mathematical apparatus; low level of development in the mathematical fields of the specific "social" fields of

application; insufficient knowledge of the calculus technique specially adapted to solving sociological research problems.

The authors of the present paper will set forth mathematical models for the organizational wellness indicator, marked as x_{wo}. There are certain sustainable development indicators for any type of organzation (industrial, non-industrial, including universities) that have to be taken into account when calculating this indicator, thus:

$\boldsymbol{x_1}$ Average gross salary accomplished/average gross salary on economy (branch)

$$x_1(t) = \frac{\text{Average gross salary accomplished}}{\text{average gross salary on economy (branch)}} \ |(t)$$

$\boldsymbol{x_2}$ Indicator reflecting the bonus weight of the accomplished total amount of gross salary

$$x_2(t) = \frac{\text{Total amount of bonus fund}}{\text{total amount of gross salary accomplished}} 100 \ |(t)$$

$\boldsymbol{x_3}$ Indicator reflecting the percentage of vacation bonus of the total amount of gross salary

$$x_3(t) = \frac{\text{Total amount of vacation bonus}}{\text{total amount of gross salary accomplished}} 100 \ |(t)$$

x_4 it is an indicator reflecting the percentage of medical bonus paid in the total amount of gross salary

$$x_4(t) = \frac{\text{Paid medical leave bonus fund}}{\text{Total amount of accomplished gross salary}} 100 \ |(t)$$

$\boldsymbol{x_5}$ Indicator of the weight of occupational disease of the total average recorded number

$$x_5(t) = \frac{Number\ of\ occupational\ disease}{\overline{Ns}} 100 \ |(t)$$

$\boldsymbol{x_6}$ Indicator reflecting the weight of technical lay off of the accomplished gross salary fund

$$x_6(t) = \frac{\text{Total fund assigned to technical lay off}}{\text{Accomplished gross salary fund}} 100 \ |(t)$$

$\boldsymbol{x_7}$ Indicator reflecting bonus weight (seniority, difficult/dangerous/toxic working conditions, etc. of the total salary fund)

$$x_7(t) = \frac{\text{Total amount of accomplished bonuses}}{\text{Accomplished gross salary fund}} 100 \,|(t)$$

$\boldsymbol{x_8}$ Indicator reflecting the percentage of employees benefiting from bonuses of the total average recorded number

$$x_8(t) = \frac{\text{Number of persons benefiting from bonuses}}{\overline{Ns}} 100 \;|(t)$$

$\boldsymbol{x_9}$ indicator of the percentage reflecting development and training expenses of the total amount of salary

$$x_9(t) = \frac{Training - related\ expenses}{Total\ amount\ of\ accomplished\ gross\ salary} 100 \;|(t)$$

x_{10} indicator of the number of hours devoted to professional development and training of the total average recorded number of employees Ns

$$x_{10}(t) = \frac{Total \text{ number of hours devoted to professional development and training}}{Ns} 100 \;|(t)$$

x_{11} Indicator reflecting the performance criteria of innovation units

$x_{11}(t)$ = number of scientific papers published in reviews + number of patents + number of products and technologies resulting from research/innovation activities, based on patents, patent acknowledgement or personal innovation + scientific papers presented at international conferences + number of physical, experimental, functional models, prototypes, norms, procedures, methodologies, regulations and technical plans

x_{12} Indicator expressing professional recognition of the innovation units

$x_{12}(t)$ = number of international awards + number of national awards by the Romanian Academy + number of doctoral advisors in the field, members of the research/innovation teams);

x_{13} Indicator reflecting the significant environment aspects

$x_{13}(t)$ = the percentage of significant environment aspects

x_{14} Indicator reflecting the quantity of air pollution emissions

$x_{14}(t)$ = emission quantity (per year t); or
quantity of potentially destructive air polluting emissions affecting the ozone layer (related to the t year); or
quantity of air emissions leading to global warming;

x_{15} Indicator reflecting the working environment

$x_{15}(t)$ is the level of noise and vibrations; or
quantity of radiations; or
quantity of warmth and light

$$x_{15}(t) = 10lg \frac{t_d \cdot 10^{Lday/10} + t_e \cdot 10^{(Levening+5)/10} + t_n \cdot 10^{(Lnight+10)/10}}{24}$$

where: t_e is ranges between 2 and 4 hours;

t_d – time of daily operation (12 hours);

t_n – time of overnight operation (8 hours).

$t_d + t_e + t_n = 24\ ore$

For each x_i, $i = 1{,}15$ indicator, including x_{wo} are time functions t, that can be expressed in years, semesters, trimesters, etc. Our suggestion is 2009 as initial working time.

Here are the models set forth for the organizational wellness modelling.

Model I

$$x_{wo}(t)\begin{cases} 0, x_2(t)+x_3(t)+x_7(t) \geq (\text{p\% Number of employees} + 1) \\ \quad -\text{Number of employees that benefited frmo bonuses} \\ \frac{1}{2}, \begin{cases} x_2(t)+x_3(t)+x_7(t) \leq (\text{p\%Number of employees} + 1) \\ \quad -\text{Number of employees that benefited frmo bonuses} \\ S \in \left[0, \left[\frac{n}{2}\right]\right] \end{cases} \\ 1, \begin{cases} x_2(t)+x_3(t)+x_7(t) \leq (\text{p\% Number of employees} + 1) \\ \quad -\text{Number of employees that benefited frmo bonuses} \\ S \in \left[\left[\frac{n}{2}\right]+1, n\right] \end{cases} \end{cases}$$

summing-up matrix of the results obtained from questionnaires (interviews):

Level / Criteria		N1	N2	N3	N4	N5
C1	Activity	$\frac{N1,1}{n} \times 100$	...	...	...	$\frac{N1,5}{n} \times 100$
C2	Independence	...	...	...	...	...
C3	Variety	...	...	...	...	...
C4	Social status	...	...	...	...	...
C5	Human interaction with higher-ups	...	...	...	...	...
C6	Peer relations	...	...	...	...	...
C7	Moral values (ethics)	...	...	...	...	...
C8	Security	...	...	...	...	...
C9	Social services	...	...	...	...	...

Level Criteria		N1	N2	N3	N4	N5
C10	Authority	…	…	…	…	…
C11	Organizational policy	…	…	…	…	…
C12	Compensation	…	…	…	…	…
C13	Promotion	…	…	…	…	…
C14	Responsibility	…	…	$\frac{N14,3}{n} \times 100$	…	…
C15	Creativity	…	…	…	…	…
C16	Working conditions	…	…	…	…	…
C17	Acknowledgement	…	…	…	…	…
C18	Recognition	…	…	…	…	…
C19	Accomplishment	…	…	…	…	…
C20	Intention of leaving	…	…	…	…	…
C21	Commitment to the organization	…	…	…	…	…
C22	Salary	…	…	…	…	…
C23	Mutual determinism	…	…	…	…	…
C24	Perceived self-efficiency	…	…	…	…	…
C25	Self-acceptance	…	…	…	…	…
C26	Coping	…	…	…	…	…
C27	Motivation	…	…	…	…	…
C28	Locus of internal control	…	…	…	…	…
C29	Emotional intelligence	…	…	…	…	…
⋮	⋮	⋮	⋮	⋮	⋮	⋮
Cw		$\frac{Nw,1}{n} \times 100$	…	…	…	$\frac{Nw,5}{n} \times 100$

Cw = criterion included in the assessment of organizational wellness

A grade will be awarded for each criterion, having the following relation:

$$Nc_i = \frac{\sum_{j=1}^{5} k_{ij} N_{ij}}{\sum_{j=1}^{5} k_{ij}} \ |(t) \ i = \overline{1, w}$$

This is obviously the weighted average of the score assigned to each criterion.

$$\frac{N_{ij}}{n} 100 \in [0,100]$$

where: N_{ij} is how many employees have selected a certain criterion C_i, level N_j

n= total number of employees

$$S = \sum_{i=1}^{w} N_{ci} P_i \ |(t), \text{ Global wellness estimator (total score)}$$

where: $\sum_{i=1}^{w} P_i = 1$

Each criterion C_i has a significance level correlated to the significance coefficient K_{ij}, thus:

- $K_{ij} = 5$ for a highly significant criterion (failing to meet this requirement entails very serious consequences for the entire organization);
- $K_{ij} = 3$ for a major criterion (failing to meet this requirement entails serious consequences that affect only certain departments);
- $K_{ij} = 1$ for a secondary criterion (failing to meet this requirement entails limited consequences).

The following classification synthesis may be employed in view of establishing (the level of) organizational wellness:

Score	Evaluation
$S \in \left[0, \left[\frac{n}{2}\right]\right]$	$x_{wo}(t) = \frac{1}{2}$
$S \in \left[\left[\frac{n}{2}\right] + 1, n\right]$	$x_{wo}(t) = 1$

Model II

$$x_{wo}(t) = x_{c1}(t) \times x_{c2}(t) \times \ldots \times x_{cw}(t)$$

$$x_{wo}(t) = \begin{cases} 0, & 50\ \% \text{ of employees selected score above } N_3 \\ \frac{1}{2}, & 50\ \% \text{ of employees selected score } N_3 \\ 1, & 50\ \% \text{ of employees selected score below } N_3 \end{cases},$$

Model III

$$x_{wo}(t) = x_{c1}(t) + \cdots + x_{cw}(t) \in \{0, \ldots, w\}$$

Organizational wellness optimization

$$x_{wo}(t) = h(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}, x_{11}, x_{12}, x_{13}, x_{14}, x_{15})$$

$$= x_1^{\alpha_1} x_2^{\alpha_2} x_3^{\alpha_3} x_4^{\alpha_4} x_5^{-\alpha_5} x_6^{\alpha_6} x_7^{\alpha_7} x_8^{\alpha_8} x_9^{\alpha_9} x_{10}^{\alpha_{10}} x_{11}^{\alpha_{11}} x_{12}^{\alpha_{12}} x_{13}^{-\alpha_{13}} x_{14}^{-\alpha_{14}} x_{15}^{-\alpha_{15}}, \alpha_i \geq 0,$$
$$i = \overline{1,15}$$

Deriving x_{wo} like function of x_1 or x_8 or x_{14} or x_{15} and determining critical points, then calculating the values of x''_{wo} for those critical points, one can identify optimal points of wellness in relation to the afore mentioned indicators.

Indicator weight

For each x_i, $i = \overline{1,15}$ indicator one can calculate its weight in x_{wo}. Thus, $p_i\% = \frac{x_i}{x_{wo}}$.

After having established the weight, one may further identify the indicators` degree of influence on wellness, one may compare these influences and may suggest solutions to their variation in time.

Open tasks

Identifying other wellness models and related optimization problems, considering that there is no mention of them in specialized literature.

Conclusions

Nowadays, industrial organizations of any type, including universities, increasingly emphasize social aspects. Certainly that employee-oriented care will urge him to work more efficiently and to generate higher productivity. A high level of organizational wellness will determine a more efficient protection and, implicitly, a sustainable development of any type of organization, including universities.

On the basis of the models set forth in this paper, we conclude by recommending a more thorough measurement of wellness at the level of an organization or its departments that is a genuine, accurate interpretation.

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