Management model of a business union in service companies of aerospace industry

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Abstract. The article contains a hypothesis about the operational properties of an employee based on an analysis of a number of empirical objects and the results of a study of the organizational behaviour of service company employees in the aerospace industry. A model of the impact on the operating performance of a separate structural unit of a company depending on a priori personnel installations is presented. Two different categories of workers: career-oriented and non-career-oriented, are the basis for adopting a priori attitudes. The second key assumption of the model is the assumption of a limited period in time during which a career-oriented employee maintains a sufficient level of performance. To maintain the efficiency of the structural unit at the required level, the management is forced to make decisions about promoting career-oriented employees and dismissing non-career-oriented employees. Within the framework of the analytical model, a region of parameter values is established corresponding to the adoption of effective personnel decisions. The range of applicability of the model has been determined: the features of the organizational structure and operating activities characteristic of service companies make it possible to consider the assumptions of the model realistic in relation to such business structures.

1. Introduction
In modern business dictionaries “a service company” is defined as a company providing services to clients, both businesses and individuals. Such a company offers intangible products. Among them are companies that provide services related to the financial sector (banks, insurance companies, etc.), medicine, education and entertainment, companies providing logistics, consulting, utilities, clearing, aerospace companies, remote sensing and other professional services.

It should be noted that companies providing remote sensing services currently receive the greatest incentives for development in the context of global digital transformation. Space services are used in various spheres of activity, both in public administration and in the national economy. Thus, one of the directions is versatile environmental monitoring. Its main consumers are research and public organizations. Demand for infrastructure and engineering projects is growing rapidly, with government agencies serving as the main consumer. Energy solutions hold a special place in the market. This segment is characterized by preferential demand from the private sector, in contrast to other market segments. At the same time, the requirements for space services in terms of
characteristics are extremely diverse, depending on specific tasks. However, that demand from energy companies has decreased due to lower oil prices. Consumers of remote sensing solutions for the marine sector provide the main demand for radar images. This sector is characterized by growth due to increased attention to problems in the field of Oceanology by public sector organizations and civil security.

At the same time, the problem of managing individual business units of such companies currently remains unsolved.

The study of the effectiveness of the employee in terms of his professional motivation at work was carried out by Dai and Allen [1]. Also the other authors [2-7] studied the relationship with motivation and career decision-making activities.

Also based on the results of several studies of the organizational behavior in service sector [8-21] we can state the importance of career opportunities as a factor in motivating employees to work productively. It should be noted that the career factor includes two other factors of motivation: financial remuneration, which increases as one progresses in the career and, possibly, in a more hidden form, improving the job content (growth of diversity and interest in working operations). The attitude to career growth and the factor of the social atmosphere are ambiguous: on the one hand, we can rise to the rank of having our own office, on the other hand, an increase in privileges leads to increased accountability and pressure from senior management. The influence of career growth factor on the business units performance is investigated below by constructing an analytical model.

Thus, the main hypothesis is the assumption that:

• there is a fundamentally different attitude to careers in the services company front-office, and on this basis all the employees of the structural unit can be divided into two categories;
• performance of career-motivated employees is higher than that of employees of the other category, but remains so only for a limited period of time.

2. Model
The model is based on the following assumptions and simplifications:

• we introduce the concept of a "career-motivated employee," meaning by this employee significant factors from implied by F. Hertsberg [22]: success, recognition of merit, promotion, interest in the work, responsibility, opportunity for growth;
• we assume that in the structural unit there are only two categories of workers: career-motivated employees are characterized by a high level of productivity, and employees who do not have career motivation (with a low level of labor performance);
• we assume that there is some positive level of labor productivity (E) only for career-motivated employees (the same for all employees of the structural unit) and zero performance level for the second category of employees. This assumption simplifies the presentation, but does not limit the generality of the subsequent discussion, because the value of the performance level can be seen as differences in levels of performance of employees of the first and second category, that is numerical value of weakly motivated employees of second category of employees.
• we assume a limited time period (T_E), during which the performance of a career-motivated employee remains at this level (also the same for all employees of the structural unit). Conditional product created by an employee during the time period T, amounts the ET. Interviews with heads of structural unit showed that in practice the T_E varies from six months to one year;
• we assume a decrease in labor performance of career motivated employees after a certain period of time as a reaction to the lack of reward (promotion to a high-ranking position). Let us also assume that in the case of an award an employee performance is not reduced.
Structural unit consisting of a number of employees of these two categories is a controlled system. The management of such a system is carried out by the head of the structural unit (within the framework of his powers and competencies), as well as by senior managers. Thus,

- the purpose of control is to maintain the average level of aggregate indicators not lower than a certain level;
- according to the control actions, career-motivated employees are promoted at the end of the period of their work, and workers of the second category who have low motivation and zero (in the model) productivity are dismissed;
- the period of the backlog of the administrative decision to promote the overage (in this structural unit!) of career-motivated employee \( T_M \) compared with the moment of finishing their "useful action period", as well as the decision to dismiss the low/zero performance employee \( T_R \) are the model parameters that characterize the effectiveness of management divisions.

A company can be either a “strong” career step - to the position of director or deputy director in another structural unit, or “weak” - to a higher position within one structural unit, for example, a junior specialist to a senior specialist. In the framework of the basic model, we assume that as control actions only strong movements of employees are possible - in positions outside the managed structural unit. We also note that the decision to move overage career-motivated employees can be realized in the form of their own dismissal. This situation is described by the model, if such a decision (of the employee) is made in a period equal to \( T_M \). If the employee’s decision is to remain in this structural unit (after reaching the zero level of productivity), his dismissal is the implementation of management decisions. A controlled system (structural unit) is a set of jobs through which a stream of people — individuals — passes over a certain period of a certain position. On the basis of an administrative decision (on an employee with relocation or dismissal), the position is vacated. Within the framework of the basic model will take all job positions identical, differing only in the category of persons occupying them. An employee with performance \( E > 0 \) held the position for the time \( T_E + T_M \) (effective time period plus the delay of the administrative decision to relocate the overage employee), the employee performance with zero hold the position for the time \( T_R \).

Figure 1 illustrates the work of the unit in case of two job positions. the performance function of the career-motivated employee has a step-from: during the period of duration \( T_E \) he shows labor performance level \( E \), as at the end of the useful life of action \( T_E \) performance instantly drops.

![Figure 1. Schedule of performance of units consisting of two positions. Both positions are occupied by career-motivated employees (E > 0).](image)
We assume that after dismissal, it is immediately filled by a new person (the result of the service personnel selection), while, with some probability \( p \), a new employee is classified as career-motivated, and with a probability of \( 1-p \) refers to the second categories.

Let us express the terms of making management decisions in shares of \( T_E \):

\[
T_m = mT_E, \quad 0 \leq m
\]

\[
T_r = rT_E, \quad 0 \leq r
\]

Let us designate the desired level of productivity of the entire structural unit as a fraction \( (d) \) of its maximum possible level \( (nE) \). Then, the average performance for the characteristic of the period – the period of performance of the career-motivated employee is

\[
d \frac{nE}{T_E}, \quad 0 < d \leq 1
\]

The average performance of the structural unit is given by

\[
\frac{npE}{pT_E (1+m) + (1-p)rT_E}
\]

And the goal of control (assumption model 6) in the time interval \( T_c \), where \( T_c \cap T_E, T_M, T_R \) is the fulfilment of the conditions

\[
\frac{npE}{pT_E (1+m) + (1-p)rT_E} \geq d \frac{nE}{T_E}
\]

Hence we obtain for the parameters of effective management:

\[
\frac{1}{d} \geq 1 + m + \frac{1-p}{p} r
\]

When exogenously given \( d \) and \( p \) we have the following range of values of the parameters of effective management in the plane \((m, r)\) (Figure 2):

![Figure 2. Range of parameter values of effective management (p <1).](image)

3. Analysis

When \( p = 1 \), \( r \) value does not affect the result of the control. The system in this case is determined - at the end of the useful life of the action of a career-motivated employee vacated position is taken by a new career-motivated person with a capacity of \( E > 0 \) (the case shown in Figure 1). In this case the function of the total performance units is periodic, with period \( T_E + T_M \), the average performance of
the structural unit is $nE/(T_E + T_m)$. If the $m = 0$, then the average performance of the structural unit is equal to the maximum possible $nE/T_R$.

The value of \( \frac{1-p}{p} \) (derivative with respect to \( r \)) is a sensitivity to a change in management $T_R$ - term dismissal of an employee with zero performance. When equiprobable substitution the vacated position with an employee of the first and second category, i.e., when $p = \frac{1}{2}$, $T_R$ growth can be compensated - in order to keep the control parameters of the effective values - equal in magnitude decrease in term of a career promotion of a career-motivated employee $T_M$. With the increasing $p$ amount of decrease in values $T_M$, compensatory growth $T_R$, decreases. On the other hand, in this case, it becomes much more difficult to compensate by the decrease in the parameter $T_R$ growth $T_M$, which reduces the management effectiveness.

At the maximum requirements for effective control ($d = 1$), the only valid values of the control parameters are zero ($m = 0, r = 0$), which corresponds to an instantaneous dismissal of the official position by inefficient employees. Practical requirement to $d$, as shown by interviews with heads of structural units range 60-70%. For $p = 1$ the range of admissible values of the parameter $m$ is 0.42 - 0.66, i.e. term replacement of worn-out career-motivated employee should be 42-66% of their useful life. And, for example, when $p = \frac{1}{2}$ has the total value $T_R$ and $T_M$ must not be greater than 42-66% of the $T_E$ (depending on the desired value $d$). Thus, reducing the quality of recruitment service and general decline in the proportion of career-motivated staff in the labor market require compensating administrative impact for reducing the decline in labor performance in specific job positions response time.

$P$-value is a measure of the effectiveness of the recruitment service. If the labor market is characterized by a certain amount of career-motivated employees, the inflow of such employees into the company with a probability that exceeds the market-specific share is the effective work of the personnel service. Assessing the labor market share of career-motivated employees is challenging. If we assume the rough appraisal, specified in (A Report Co-Authored by the Center for Creative Leadership and Booz Allen Hamilton, 2011) to 25-27%, then the neutral behavior of a company’s personnel service (selection of career-oriented employees with a probability equal to the market rate), with the total value $T_R$ and $T_M$ should be no more than 16-25% of the $T_E$ (for values of $d$, equal to 70% and 60% respectively).

The development of the model is considering operations of specialization in a structural unit by introducing different categories of job positions that will obviously lead to a stratification of the structural unit on several clusters, operating under the basic model, but having different numerical values of the control parameters.. When developing a model, the idea of a model for making managerial decisions in an organization, known as the garbage can model, which was analyzed in (Smarzhevsky, 2013), can also be used. The analogy here is about the problems of the flow of persons occupying important positions in the diviso. The determination of the structure of the decision-making council should lead to a more detailed management process by separating the areas of responsibility: the head has the authority of the structural unit to carry out the “weak” (internal) movement of staff and the head of a higher level. – the “strong” one. In this case, depending on the structure of the decision-making system, it is necessary to introduce several control parameters $(T_M, T_M', \text{etc})$ instead of $T_M$. 


4. Conclusions
Based on an analysis of empirical objects, as well as a number of studies of the organizational behavior of banking sector employees, a hypothesis is formulated about the properties of an employee’s operational indicators and a specification model is proposed that describes a single structural unit. The model provides an explanation for the observed dependence on the nature of the practice of an individual structural unit of those stages of the life cycle of the organizational structure to which it belongs.

During the reorganization of the organizational structure, a significant number of jobs were vacated and new ones created, both structural units and structural units performing control and administrative functions were removed and are functioning. During this period, career opportunities for career-motivated employees appear, as there are old and there are new positions to which management can transfer such employees. Realization of reward in the form of a career promotion, if the input flow of people are career-motivated employees with sufficient intensity, allows you to maintain the effectiveness of an individual structural unit at the required level.

The life cycle phase of a company, which is a static organizational structure, is characterized by a shortage of vacant jobs. The career opportunities of staff are limited, career-motivated employees do not receive, as part of the company, the expected remuneration, which leads to poor performance of the structural unit as a whole. This effect causes an excessive increase in the timing of decisions on job displacements ($T_{D}$) and timing of dismissal of poorly performing employees ($T_{R}$).

The number of model parameters is accepted as exogenous, therefore, this model is a model of the level of a structural unit (SU). Further development of the proposed (basic) approach will allow us to build a higher-level model that takes into account both the internal aspect of the activities of structural units and the relationship of various operational and administrative units within the organizational structure of the company as a whole.

Acknowledgments
The reported study was funded by RFBR, project number 20-010-00788.

References
[1] Day R and Allen T D 2004 J Vocat Behav 64 72–91
[2] Barth T 1993 Rev Public Pers Adm 13(4) 27-42
[3] Brief A and Weiss H 2002 Annu. Rev. Psychol. 53 279 –307
[4] Arthur M, Khapova S and Wilderom D 2005 J Organ Behav 25(2) 177-202
[5] Guay F 2005 J Career Assess 24 77-96
[6] Milne P 2007 J. Knowl. Manag. 11 28-38
[7] Sullivan S 1999 J Manage 25(3) 457-84
[8] Conway N and Briner R 2002 J Vocat Behav 61 279-301
[9] Coyle-Shapiro J 2002 J Organ Behav 23(8) 927-46
[10] DeVos A, Buyens D and Schalk R 2003 J Organ Behav 24 537-59
[11] Chursin R, Yudin A, Grosheva P, Filippov P and Butrova E 2019 IOP Conf. Ser.: Mater. Sci. Eng. 476(1) 012005
[12] Beigi M and Shirmohammad M 2011 Manag Serv Qual 2(5) 552-67
[13] Jehanzeb K, Rasheed M F, Rasheed A and Aamir A 2012 IJBSS 3(21) 272-8
[14] Rashid S and Rashid U 2012 AJISS 1(2) 24-33
[15] Ladhari R 2008 J. Financial Serv. Mark 14(1) 70-82
[16] Meena M and Dangayach G 2012 IJHAS 1(2)
[17] Min-Hsin H 2008 J. Serv. Manag. 19(4) 458-73
[18] Pinar M, Zeliha E and Sandy S 2010 J. Mark. Manage. 20(1) 87-104
[19] Smarzhevskaya T and Smarzhevskiy I 2019 Econ. Manag. Prob. Sol. 3(2) 98-104
[20] Suhaimi A, Saban G and Hamali J 2011 Int. J. Qual. Reliab. Manag. 28(5) 542-55
[21] Yavas U 2006 J. Financial Serv. Mark 12(1) 30-8
[22] Herzberg F, Mausner B and Snyderman B 1959 *The Motivation to Work.* (New York: John Wiley & Sons)