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# Cost of Human Capital Estimation and Management in Medical Organization

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**Abstract:** The purpose of this research is the analysis and improvement of technology of human capital cost management for maintaining efficient personnel policy in a modern organization. The study offers researchers method of assessment and management of investments in human capital. This method involves structure of cost behavior during formation and development of human capital, change history of investment risks on each stage of business career, modeling of volume of investments on various degrees of their riskiness, mathematical analysis and forecasting profitability of investments in human capital, development of recommendations on human capital cost management. Furthermore, it determines investment appeal of human capital development. The real method is assayed on the materials of a project on human capital development in "KORL" JSC. To maintain human capital cost management we offer systematic monitoring of its current value and change on the basis of the offered optimizing models, following the investment approach for personnel decision making, personalization in accounting the investments in human capital and its profitability.

**Key words:** Human capital, investments in human capital, riskiness of investments in human capital, human capital cost management, Russia

## INTRODUCTION

Human capital cost, its structure, quality and efficiency have significant impact on strategic competitiveness of modern company and which form its intellectual capital and fundamental cost. In the middle of the last century, Schultz (1971) was the first to suggest the term "human capital" to describe mix of experience, knowledge and skills which are used for personal and social problems solving and made a case for macro economical approach in its evaluation. Becker and Murphy (1990) formulated micro-economical approach to human capital management. Kendrick (1976) executed a coat-based method for evaluation of human capital cost. Later, Mincer (1994) made an analysis on evaluation of education and labor activity contribution to human capital. According to Mulligan and Martin (1995) have explained original method of total human capital stock evaluation with the help of indexing system. New wave of scientific interest is connected with active development of concepts of intellectual capital management as a base of fundamental cost of the company. Brooking (1996) investigated impact of human assets on other components of the intellectual capital infrastructure and market assets. Later, the issue of human and intellectual capital management efficiency was developed by: Kiernan (1997), Stewart (1997), Edvinsson and Malone (1997), Roos *et al.* (2005), Hayton (2005), Wright and McMahan (2011), Shaw *et al.* (2013) and Palei and Salakhatdinova (2014) and others.

Above mentioned researchers at the high theoretical level considered the mechanism of simple and expanded reproduction of human capital, factors influencing on efficiency and offered various methods of human capital cost evaluation on micro and macro level. At the same time, the insufficient attention is paid to monitoring the risks of human capital functioning and development and its consideration in the course of human capital cost and profitability forecasting.

## MATERIALS AND METHODS

Formation of effective human capital cost management is impossible without adequate valuation of investments in its functioning and development. The problem of riskiness of investments in human capital is covered in scientific literature quite fragmentary. An unresolved problem is search of the acceptable methods of cash flows forecasting for investments in human capital. We suggest a method which is based on

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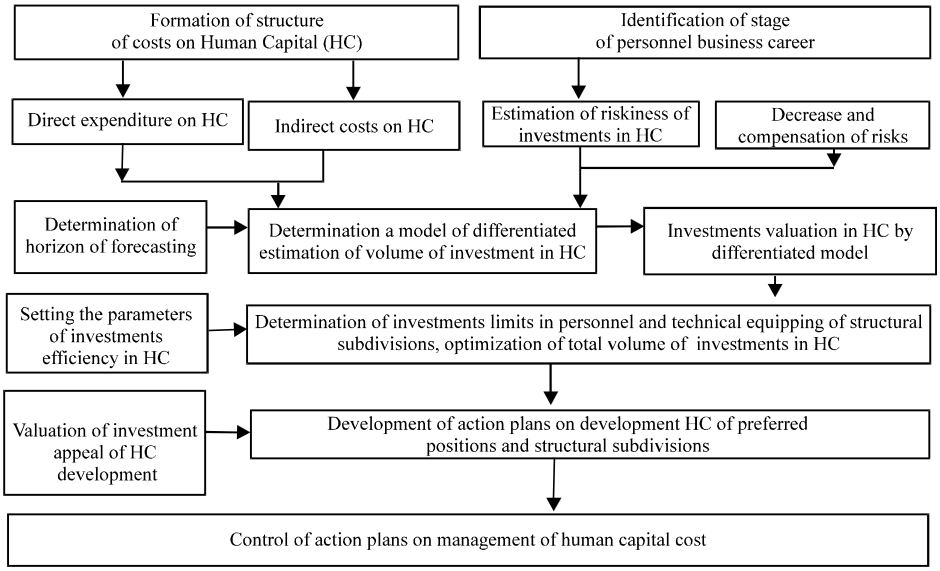


Fig. 1: Human capital cost management technology

synthesis of cost approach on valuation of cumulative investments and expert method of investments riskiness valuation on several stages of business career. This method is intended to evaluate investments on the basis of differentiated models which take specific risks during functioning and development into account. Together with it there shall be forecasted parameters of return on investments in human capital. It allows to set limits of investments and to estimate investment appeal. The general logic of the offered technique is schematically illustrated in Fig. 1.

## RESULTS AND DISCUSSION

Approbation of the method is carried out on materials of the project on human capitalin "KORL" JSC. This organization is a versatile institution rendering hi-tech medical services to inhabitants of the Republic of Tatarstan and other regions of the Russian Federation. The management of "KORL" JSC set the task of improvement of human capital quality in such perspective directions as ophthalmology, vascular surgery, cardio surgery, cold coblation and endo-venous laser coagulation by reinforcement the personnel with highly qualified executives and specialists. The structure of costs on functioning and development of the "KORL" JSC personnel in 2012 - 2014 shows the allocation of costs in preferential directions of human capital development in Fig. 2. The researchers method uses approach on forecasting of optimum value of cumulative investments in a workplace or a position in relation of newly employed heads and specialists of "KORL" JSC. For this puprose

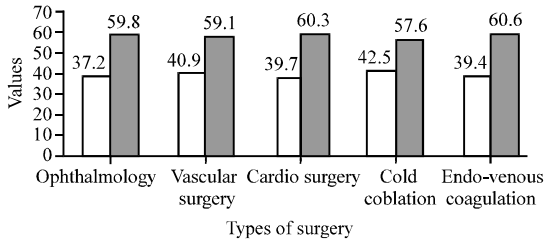


Fig. 2: Structure of costs in human capital

the differentiated models of valuation of investments in human capital were developed taking into account degree of their riskiness.

Change history of riskiness of investments in human capital functioning and development has uneven character and depends on a phase of career of workers or stage of life of a position. There should be allocated four phases of career with serious changes of investments riskiness on each stage (Fig. 3). In the course of valuating ofinvestment in human capital development it is quite natural to use the differentiated models with provision for degree of investments riskiness, reflecting safe, aggressive and balanced investment policy in relation to object of investments. Mathematical models developed by the researcher are given in Table 1; Ori is annual salary in a previous year; Cni is the fixed share of bonus from a salary; Cci is a fixed indexing share from a salary; Jni awarding bonuses index in a previous year; Jci is indexing coefficient in a previous year; Dci is a share of insurance from a salary; Dni is a share of social payments and privileges from a salary; Dqi a share of costs of retraining and professional development; Dki a share of

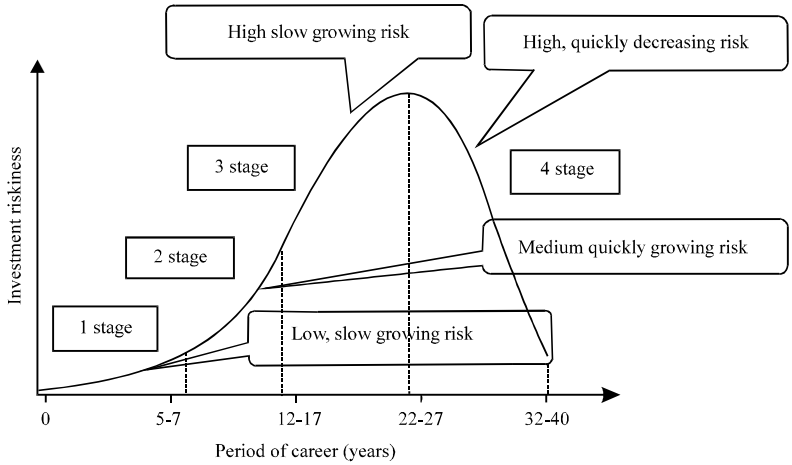


Fig. 3: Change history of riskiness of investments in human capital

Table 1: Differentiated models of valuation of investments in human capital development

| Stage of business career of employee | Level of investment riskiness | Differentiated models of estimation of volume of investments | Investment policy |
|---|---|---|---|
| Start of career | Low, slow-growing risk | $Umin = \sum_{i=1}^{n} Ori.(1+Cci+Cni+Dci+Dni+Dqi).(1+Dki).(1+Rh\times Bi)^{i}$ | Safe |
| Quick growth of career | Medium, quickly growing risk | $Umax = \sum_{i=1}^{n} Ori.Jni^{i}.Jci^{i}.(1+Dci).(1+Dni).(1+Dqi).(1+Dki).(1+Rh\times Bi)^{i}$ | Aggressive |
| Top of career | High, slow-growing risk | $Umax = \sum_{i=1}^{n} Ori.Jni^{i}.Jci^{i}.(1+Dci).(1+Dni).(1+Dqi).(1+Dki).(1+Rh\times Bi)^{i}$ | Aggressive |
| End of career | Quickly decreasing risk | $Umid = \sum_{i=1}^{n} Ori\times Jni\times Jci\times(1+Dci)\times(1+Dni)\times(1+Dqi)\times(1+Dki)\times(1+Rh\times Bi)^{i}$ | Balanced |

Table 2: Calculation of forecasting volumes of investments in executives and specialists in "KORL" JSC from 2015-2017

| | | Parameters of model of investments valuation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Positions | Models | Ori | Cni | Cci | Jni | Jci | Dci | Dni | Dqi | Dki | Bi | Rh | Volume (thous.rub.) |
| A head of vascular surgery department | Umid | 507.2 | - | - | 1.45 | 1.1 | 0.11 | 0.15 | 0.13 | 1.44 | 0.12 | 1.19 | 11221.9 |
| Cardio surgery | Umax | 392.7 | - | - | 1.44 | 1.1 | 0.08 | 0.14 | 0.18 | 1.52 | 0.12 | 1.39 | 16644.9 |
| Chief ophthalmology | Umax | 452.9 | - | - | 1.48 | 1.1 | 0.09 | 0.17 | 0.21 | 1.49 | 0.12 | 1.35 | 21300.6 |
| Anasthetist in the department of cold coblation | Umin | 263.5 | 0.31 | 0.1 | - | - | 0.09 | 0.11 | 0.12 | 1.36 | 0.12 | 1.13 | 4184.5 |
| Surgery of endo venous laser coagulation | Umax | 421.3 | - | - | 1.39 | 1.1 | 0.12 | 0.24 | 0.15 | 1.54 | 0.12 | 1.47 | 18549.7 |
| Total investments in human capital | | | | | | | | | | | | | 71901.7 |

indirect costs per direct expenditure on personnel; Bi discounting coefficient; Rh the correction coefficient considering additional risks.

The offered models were used for forecasting of volume of investment in human capital of newly employed executives and specialists of "KORL" JSC and the results of settled calculations are presented in the Table 2. As follows from Table 2, the most essential investments are predicted in highly qualified specialists. It is supposed that these positions will be held by the skilled, ambitious employees of the top qualification who did not reach the top of career and are very demanded in labor market. Therefore risks of investment will be maximum (Umax) here. Investments into administrative position are predicted less essential as it is supposed to engage the employees who have already reached the top of career and is less demanded in labor market. Therefore, there was chosen the Umid model for investments valuation. To a position of the anesthesiologist it is planned to engage the young, perspective employee who is on an initial phase of business career, whose business and personal prospects are only to be under estimation (Umin).

The economic foundation of the project on development of human capital assumes valuation of its investment appeal. It is expedient to use system of indicators of investment efficiency of UNIDO, in particular, to estimate the level of net current value of the project NPV. As investments in human capital development are distributed on time, the modified formula of calculation of the net discounted return was applied:

$$NPV_{HC} = \sum_{t=1}^{n}\left[-I_{HC_t} + \frac{CF_{HC_t}}{(1+N)^{t}}\right]$$

Table 3: Valuation of investment appeal of the project on human capital development in "KORL" JSC in 2015-2017

| | Volume of investments (mln. rub.) (2015-17) | | | | Cash flow (mln. rub.) (2015-17) | | | | Net discounted return (mln. rub.) (2015-17) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Positions | $I_{HC}$ | $I_{HC}$ | $I_{HC}$ | Total | $CF_{HC}$ | $CF_{HC}$ | $CF_{HC}$ | Total | $NPV_{HC}$ | $NPV_{HC}$ | $NPV_{HC}$ | Total |
| A head of vascular surgery department | 3.25 | 3.72 | 4.250 | 11.22 | 2.86 | 5.69 | 7.27 | 15.81 | -0.70 | 0.82 | 0.92 | 1.04 |
| Cardio surgery | 2.66 | 4.91 | 9.080 | 16.64 | 2.34 | 7.51 | 15.52 | 25.37 | -0.57 | 1.08 | 1.97 | 2.48 |
| Chief ophthalmology | 3.29 | 6.23 | 11.78 | 21.30 | 2.90 | 9.53 | 20.15 | 32.57 | -0.71 | 1.37 | 2.56 | 3.22 |
| Anasthetist in the department of cold coblation | 1.22 | 1.39 | 1.580 | 4.180 | 1.08 | 2.12 | 2.69 | 5.89 | -0.26 | 0.30 | 0.34 | 0.39 |
| Surgery of endo venous laser coagulation | 3.07 | 5.53 | 9.950 | 18.55 | 2.71 | 8.46 | 17.01 | 28.17 | -0.66 | 1.22 | 2.16 | 2.72 |
| Total investments in human capital | | | | 71.90 | | | | 107.83 | | | | 9.84 |

Where:

$NPV_{HC}$ = Net discounted return on investment in human capital

$I_{HCt}$ = Annual volume of investments in human capital

$CF_{HCt}$ = Cash flow for investments in previous year

N = Rate of discounting

n = Period of forecasting

The serious and still not solved problem is the low accuracy of forecasting of individual contribution of workers to integrated financial performance of work. Therefore, for an assessment of streams of payments on investment in human capital of CFHCt there was conducted research of nature of dependence between investments in human capital development and dynamics of return on net assets of "KORL" JSC for 2012-2014 that allowed to develop mathematical model of the following type:

$$CF_{HC_{2012\text{-}2014}} = 0.88I_{HC_{2012}} + 1.53I_{HC_{2013}} + 1.71I_{HC_{2014}}$$

Results of calculation of targets NPVHC, proving investment appeal of the personnel decisions on human capital development in "KORL" JSC are shown in Table 3.

## CONCLUSION

Following the results of the offered method there were formed the priority directions of human capital cost management improvement, basic ones of which are as follows: systematic monitoring of cost of human capital on the basis of the recommended optimizing models, tracking of its change, the analysis of the factors influencing the efficiency, taking actions on human capital development; personnel decisions should be taken in the form of investment projects to maintain investment valuation on foreseeable horizon of planning, forecasting of profitability of investments and assessment of investment riskiness which gives a chance to prove investment appeal of projects; improvement of system of administration and accounting in the direction of personalization of investments accounting and their profitability that provides adequate statistical base for development of the specified forecasts on volumes of investment and cash flows for investments in human capital functioning and development.

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