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Risks of investment in personnel development: evidence from Ukrainian IT companies

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Introduction

In recent decades, the information technologies (IT) sector grew dramatically. Nowadays, IT is integrated with almost every part of life, and it is apparent that this tendency will continue in the future. This trend explains the high level of demand for IT specialists globally. According to modern economic theory, human capital has become one of the main production factors and the most promising direction of investment, as such investment creates an opportunity to obtain high and long-term economic and social effects. According to the Innovation Economy Global Outlook conducted by Silicon Valley Bank in 2014 (see Report), regions that build talent pools populated by motivated workers with relevant skills have the chance to become a destination of choice for rapidly growing companies and to provide their citizens with high quality, well-paid jobs.

The IT sector is representative of this new economy that is most dependent on human capital as the main competitive factor. So, the question for this sector is not whether investment in the development of personnel should be made, but what the most effective ways of performing it are and who has to pay for the education: the worker, the company or the government. Undoubtedly, every link in this human capital production chain plays its own very important role and a consolidated effort will lead to the best results. However, in this paper we aim to concentrate on the micro level and study a firm as a contributor to human capital enrichment. The development of personnel requires investment, the results of which are unpredictable due to many internal and external factors. Thus, investment in the human capital of a firm is associated with risks. The necessity to find a balance between potential gains, benefits and risks on the one hand, and to build a complex method for risk estimation on the other, explains the timeliness of this research.

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Review of related studies

There are many scientific works exploring the concept and role of human capital, starting with Smith (1771), the first classical economist, who included this kind of capital in his definition of capital. Further, such well-known economists as Mincer (1954), Becker (1964), and Schultz (1981) contributed significantly to the study of investment in human capital. Barro (1991), Riddell (2006), and Hanushek (2012) explored the economic effect of education. Grishnova (2002), Oluwatobi (2011), Ogunrinola (2012), Sarra, Benabou and Tabeti (2013) studied the role of government in human capital development. And such economists as Dobrynin, Dyatlov and Tsyrenova (1999), Christiansen, Joensen and Nielsen (2006), Zaklekta-Berestovenko (2008), and Koerselman and Uusitalo (2013) examined the ROI of investment in human capital. In addition, there are a lot of studies regarding the development and training of personnel, its positive and negative aspects, and its effect on the firm's performance: Aragón, Jiménez and Valle (2013), Aguinis and Kraiger (2009), Wall and Wood (2005), and Collins and Clark (2003). Fitz-enz, who is considered to be the father of human capital benchmarking and performance assessment with his book „The ROI of human capital” (2009), provided a methodology for measuring the bottom-line effect of employee performance. In recent years, Zakharova contributed significantly to the topic of evaluating the factor of risk that occurs if a firm invests in the development of its personnel in her monograph „Management of investment in human capital: methodology, estimation, planning” (see Zakharova 2010). On the other hand, there is a lot of scientific research related to risk estimation in general terms, namely in the field of investment risk assessment. The fundamentals of investment were described by Sharp (2003) and Blank (2000). Vitlinskiy (2000) and Kaminskiy (2002) examined and explored general risk determination and econometric approaches to its evaluation in great detail. Nevertheless, there is still a gap in the theory and its application for the determination, classification and estimation of risks of investment in human capital of a firm in general terms and especially related to human capital in the IT sector.

Risks of investment in the development of IT personnel

Nowadays, occupations in science and engineering are at the leading edge of economic competitiveness in an increasingly globalized world, and science and engineering human capital of sufficient size and quality is essential for any 21st century economy to prosper.

According to „Exploring Ukraine: IT Outsourcing Industry 2012” (see Report), during the last decade Ukraine has been the leading provider of software development and IT outsourcing services in the Central and Eastern European

region (excluding Russia). Ukraine is ranked first in the volume of IT outsourcing and software development services provided, in the number of IT specialists working in the industry, and in the number of IT graduates. Moreover, the level of technical education in Ukraine remains high, and according to the „Human Capital Report 2013”, Ukraine was ranked 24th out of 122 countries in the category of quality of math and science education.

Highly qualified personnel are at the core of the software development business. The presence of educational institutions for IT personnel training and education plays a very important role in the industry’s development. The question is how to develop highly-demanded IT workers while handling the possible risks.

There are different approaches to investment strategies of the development of employees (see Zaklekta 2008), and they are applicable to the IT sector: the development of the core management team only, the development of all employees, hiring already trained workers, on-the-job training, and on-demand ad hoc development. Any development investment strategy is used by a firm in accordance to its goals, strategy, economic sector, the line of business, and development approach.

In this research, we consider that a company invests in its human capital and assume that a selected strategy will lead to risks. We define risks of investment in the development of the personnel of a company (RIDPC) as both an objective and a subjective category of the firm’s activity which constitutes the probability of receiving additional competitive benefits and economic gain, as well as the likelihood of partial or complete loss of invested resources, depending on how effective the company’s management of the factors of uncertainty is. We adhere to the positive approach to the phenomenon of risk, which emphasizes the opposite side of risk – the potential success of entrepreneurial activity as a result of effective human resource and firm management and favorable external conditions. The sources for the transition from threats to opportunities in this direction comprise new methods and approaches to management, an effective training and development policy, improvement in the corporate culture, deep and considerate market analysis and adequate planning according to the results of the analysis.

In the framework of the general economic theory, investment in the development of the personnel of a firm is the process of improving employees’ knowledge and skills realized in adapting to the job, professional learning, training, work assessment, and career planning.

The main features of RIDPC in the IT sphere are the following:

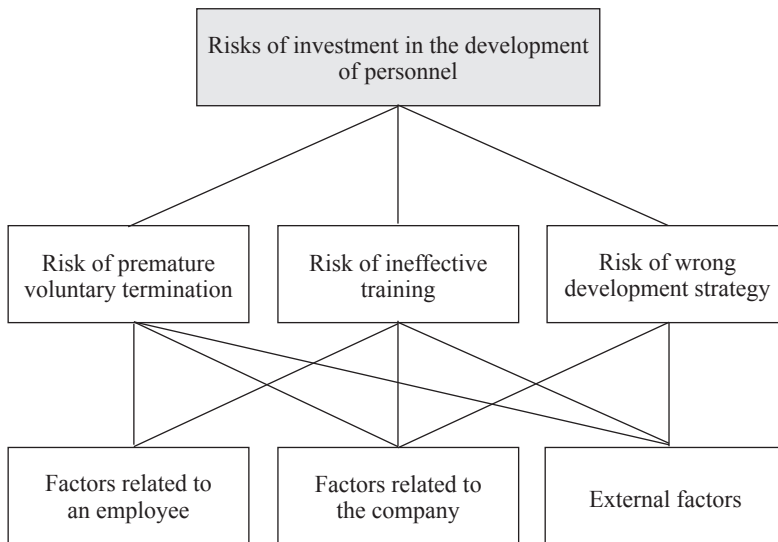
1. The highest weight of human factor in this kind of risk significantly complicates the process of analysis and quantitative estimation and, accordingly, this kind of risk will always have the highest level of uncertainty. Among other kinds of risk, these risks are much more characterized by the features of conflict, which results in uncertainty.
2. In the knowledge-based economy, and the IT sphere in particular, human capital becomes the most important means of production, thus the analysis of the risks of investment in its development increases in significance.

3. Globalization of IT labor markets increases the level of RIDPC because global companies have access to the most talented and trained workers in any part of the world, while for the local companies the labor market becomes more competitive.
4. Currently, the RIDPCs are not researched enough, companies do not have a robust methodology for analyzing them, and there is a lack of skilled analysts in this area.

In particular, in analyzing RIDPCs, we singled out three main categories of factors that influence them (Fig. 1):

1. related to an employee,
2. related to a company,
3. external factors.

Figure 1. Risks of investment in the development of personnel and factors that influence them



Source: own elaboration.

Moreover, there are three main RIDPCs:

1. Risk of premature voluntary termination – a risk that an employee trained by the company will leave it before the invested resources are recovered.
2. Risk of ineffective training – a risk that the personnel of a company will not achieve the target results of training. Typically, the reason, in such a case, is an insufficient level of learning skills, competencies and motivation of employees, although it can also be caused by poor HR training or external provider performance.
3. The risk of the wrong development strategy – a risk that the company will choose an inappropriate employee development plan which will

have only a short-term effect or will not give competitive advantages. We consider two factors that influence this kind of risk: 1) consistency in the company's general strategy and HR policy – the development program should comply with the general goal and strategy that the company has; 2) correspondence of the personnel development plan to the employees' real needs based on the results of their assessment.

The model

In this research, we will focus on the risks from the perspective of the factors that are the source of those risks: originating from the personnel, from the company or from the external environment. The basic formula of the estimation of risks of the investment in human capital of a company is as follows:

$$R = Q_1R_1 + Q_2R_2 + Q_3R_3 \quad (1)$$

where R is the value of the general risk of investment results.

R_1 (risk caused by the employee) – the likelihood that employee behavior will lead to negative results of investment or the employee will leave the firm before the resources invested in him/her will be recovered.

R_2 (risk caused by the company) – the likelihood that a company will not perform optimally in the area of employee development: training programs will not be selected according to real needs of employees and firm strategy; hired employees will not suit perfectly the respective positions and share the firm's values; external training providers and products selected by the HR division will not be reliable or qualitative enough.

R_3 (risk caused by external conditions) – the likelihood that the economic situation, labor market conditions, and competitors' actions will influence negatively the investment results.

Q_1, Q_2, Q_3 – the respective weights of each group of risks calculated as a result of pairwise comparisons.

It should be emphasized that each highlighted factor and sub-factor that can influence the investment results has to be evaluated in view of the possibility to have a negative impact, i.e. lead to an undesired outcome. Avoiding inconsistency in the evaluation of „positive” and „negative” factors is a necessary condition of receiving the correct index. For example, when evaluating competencies we will generally assign minimum risk to the employee who has the highest level of competencies and maximum to the one whose competencies are lowest compared to the others.

Risks related to the employee

This is the main group of risks associated with the greatest unpredictability. In the previous section, we described the factors that influence this kind of risk. In this section, we will estimate the respective weights of each factor and focus on the possible outcomes related to employee behavior. To evaluate R_j , we use the following formula:

$$R_1 = W_1X_1 + W_2X_2 + W_3X_3 + W_4X_4 \quad (2)$$

where W_1, W_2, W_3, W_4 are the respective weights of each kind of risk calculated as a result of pairwise comparisons.

X_j – investment results can be influenced by the motivation of the employee. X_j is determined by a number of sub-factors that can be represented with the next formula:

$$X_1 = w_{11}A_1 + w_{12}A_2 + \dots + w_{1m}A_m \quad (3)$$

where A_m – sub-factors (variables) used in calculating the risk of type X_j , and w_{1m} – coefficients of weight (importance) of these sub-factors that are calculated after pairwise comparison, $m = 1,5$.

The A_m variables are likelihoods that the motivation of an employee can be influenced by the following sub-factors:

A_1 – wages,

A_2 – additional benefits,

A_3 – career opportunities,

A_4 – interestingness of the work and engagement level,

A_5 – corporate culture strength.

X_2 – investment results can be influenced by the performance of an employee. X_2 is determined by three main sub-factors that can be represented with the formula:

$$X_2 = w_{21}B_1 + w_{22}B_2 + w_{23}B_3 \quad (4)$$

where B_m – sub-factors (variables) used in calculating the risk of type X_2 , w_{2m} – coefficients of weight (importance) of these sub-factors that are received after pairwise comparison, $m = 1,3$. The B_m variables are the likelihoods that results of investment in the development of an employee can be influenced by the following sub-factors:

B_1 – achievements,

B_2 – work commitment,

B_3 – time with the company.

X_3 – investment results can be influenced by the level of employee's competencies. Probability X_3 consists of four main competencies that are represented with the formula:

$$X_3 = w_{31}C_1 + w_{32}C_2 + \dots + w_{3m}C_m \quad (5)$$

where C_m – sub-factors (variables) used in calculating the risk of type X_3 , and w_{3m} – coefficients of weight (importance) of these sub-factors that are calculated after pairwise comparison, $m = 1,4$. The C_m variables are likelihoods that results of investment in the development of an employee can be influenced by the following competencies:

C_1 – achievement orientation,

C_2 – customer orientation,

C_3 – learning skills,

C_4 – teamwork and cooperation.

X_4 – investment results can be influenced by personal reasons of an employee.

Risks related to the company

To evaluate P_2 we use the following formula:

$$P_2 = S_1Y_1 + S_2Y_2 + S_3Y_3 + S_4Y_4 + S_5Y_5 + S_6Y_6 + S_7Y_7 \quad (6)$$

where:

Y_1 – factor of staff development plan,

Y_2 – consistency of strategies,

Y_3 – salary,

Y_4 – corporate culture,

Y_5 – interesting work and projects,

Y_6 – team,

Y_7 – career opportunities.

S_1, \dots, S_n – coefficients of weight (importance) of these factors, $n = 1,7$.

Risks related to external changes

Risks related to the macroeconomic situation and labor market conditions are defined as external factors in the „firm-employee” relationship. Some of them are the same for the whole sector or economy. In the framework of our research, to estimate P_3 , we will focus on the following factors:

$$P_3 = T_1Z_1 + T_2Z_2 + T_3Z_3 + T_4Z_4 + T_5Z_5 + T_6Z_6 \quad (7)$$

where:

Z_1 – economic and political situation,

Z_2 – labor market situation,

Z_3 – competitors’ actions,

Z_4 – training market situation,

Z_5 – political changes,

Z_6 – technological changes.

T_1, T_2, \dots, T_n – coefficients of weight (importance) of these factors, $n = 1, 6$.

The problem

One of the distinctive features of the investment in human capital of a company is that, unlike the human capital of a country, for which almost every kind of investment brings a generally positive effect, the benefits for the company are determined by its relative utility in limited economic spheres, as well as by the possibility of employees’ movement in the labor market (see Grishnova 2002).

The main problem and difficulty with the quantitative estimation of RIDPC and its forecasting is the human factor. Human behavior is often unpredictable and complex, so it requires specific approaches and methods of assessment. The main features of human behavior are the following (see Zakharova 2010):

1. Impossibility to measure exactly the intellectual abilities and the level of motivation for an individual’s personal professional development at the pre-investment stage.
2. Different speed, learning abilities, and work performance of employees that depend on intellectual potential, the individual proportion of motivation factors, labor behavior, and opportunities to enrich the received knowledge at the workplace.
3. Instability of the physiological and emotional condition of an individual, changing personal reasons, goals, aspirations, values, abilities to learn, and career expectations.

4. Individual sensitivity to organization's corporate culture and social atmosphere, which influences the productivity of an employee.
5. Different ROI of development depending on the stage in the life cycle of an individual employee.
6. Individual health conditions and physical abilities.

There are a number of classic methods of estimating the effectiveness of investment and risk. According to classic investment management theory, the standard approach to determine whether an investment project is profitable is to calculate the return on investment (*ROI*). This indicator shows the ratio between profit and loss. So, if the $ROI > 1$ the project is profitable, and if the $ROI < 1$ the expected losses are higher than the gains. The *ROI* for human capital can be calculated using the following formula (Fitz-enz 2000):

$$HC ROI = \frac{Revenue - (Expences - [Pay + Benefits])}{Pay + Benefits} \quad (8)$$

However, a risk-based evaluation can be considered a complementary alternative to an *ROI*-based one, as in some situations (like assessing a single employee) it is not feasible to calculate the revenue associated with a particular investment while risks can generally be estimated more easily (because the estimation may be performed indirectly).

Based on real options theory, Bhattacharya and Wright (2000) conceptualize the following types of risks and uncertainties associated with the management of HC: uncertainties of returns or performance, uncertainties of volume, and uncertainties of costs and combinations.

If we consider investment in the development of personnel as a business model it can be described as the function of income I that depends on endogenous and exogenous variables:

$$I = f(x_1, x_2, \dots, x_p, y_1, y_2, \dots, y_p) \quad (9)$$

where I – income of a firm, $x_p, i = 1, p$ are endogenous variables, including expenses on personnel development, and $y_p, j = 1, q$ – exogenous variables that are out of the firm's control.

If we approach investment in the development of personnel as a real investment project it is worth considering the methods of investment project estimation such as *NPV* (net present value), *PI* (profitability index), *IRR* (internal rate of return), *DPP* (Discounted Playback Period), *MIRR* (Modified Internal Rate of Return), *PP* (Payback Period), and *GPV* (Gross Present Value). Also, a number of capital investment decision methods can take risks into account, but each of them focuses on different factors and has its limitations, especially if we deal with the human factor of uncertainty. Ye and Tiong (2000) suggested using the net-present-

-value-at-risk (*NPV-at-risk*) method that combines the weighted average cost of capital and dual risk-return methods. The evaluation of two hypothetical power projects shows that the *NPV-at-risk* method can provide a better framework for risk evaluation of the investment. Serguievaa and Hunterb (2004) suggested a fuzzy criterion, and subsequently derived a measure of the risk associated with each investment opportunity and an estimate of the projects' robustness towards market uncertainty. An alternative fuzzy approach permits fluctuations well beyond the probable type of uncertainty and allows one to make fewer assumptions about the data distribution and market behavior.

Classical methods of quantitative assessment of investment risk such as CAPM (capital asset pricing model), standard deviation, the Sharpe ratio, variance-covariance, the Monte Carlo method, method of analogies, and expediency of costs are hardly compatible with the human factor, unlike the qualitative approaches, such as expert methods, ranking or pairwise comparison, which allow the unpredictability of human behavior to be taken into account.

Approach

To build a comprehensive method of estimation of the RIDPC considering the human factor, we decided to use the method of Analytic Hierarchy Process (AHP) that was initially created and developed by Thomas Saati in 1976 (see Saati 1980). The Analytic Hierarchy Process is a structured technique for dealing with complex decisions. A hierarchy is a system of ranking and organizing people, things, ideas, etc., where each element of the system, except for the top one, is subordinate to one or more other elements. Initially based on the knowledge of mathematics and psychology from the 70's and the 80's, it has been extensively studied and refined since then. In our research, we use the AHP because it helps capture both subjective and objective evaluation measures, providing a useful mechanism for checking the consistency of the evaluation measures and alternatives suggested by the team, thus reducing bias in decision-making. Moreover, the AHP provides a comprehensive and rational framework for structuring the problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions. In the field of strategic human resource management, the AHP analysis helps to determine and study different factors that influence personnel motivation and performance.

Users of the AHP first decompose their decision problem into a hierarchy of more easily comprehended subproblems, each of which can be analyzed independently. It consists of the overall goal, the group of options or alternatives for reaching the goal, and the group of factors or criteria that relate the alternatives to the goal. The criteria can be further broken down into sub-criteria, sub-sub-criteria and so on, to as many levels as the problem requires.

Once the hierarchy is built, the decision makers systematically evaluate its various elements by pairwise comparison. What is applicable to the estimation of RIDPC is that in making the comparisons, both objective data and judgments of experts may be used. The AHP converts these evaluations to numerical values that can be processed and compared. In the final step of the process, numerical priorities are calculated for each of the decision alternatives. These numbers represent the alternatives' relative ability to achieve the decision goal, so they allow a straightforward consideration of the various courses of action.

According to the AHP, it is supposed that the value function has the form:

$$v(y) = \sum_{i=1}^q w_i y_i \quad (10)$$

if $w_i = 0$, the corresponding outcome y_i can be removed from consideration. Thus, it is assumed that $w_i > 0, i = 1, q$.

The weight ratio is defined by:

$$w_{ij} = \frac{w_i}{w_j} \quad (11)$$

Human perception and judgment are subject to change when the information inputs or psychological states of the decision change. Consequently, a fixed weight vector is difficult to find. Saati proposed the following to overcome this difficulty: estimate or elicit the weight ratio w_{ij} by a_{ij} and let $A = [a_{ij}]_{q \times q}$ be the matrix of components $\{a_{ij}\}$. As each $w_{ij} > 0$ it is assumed that all $a_{ij} > 0$. Furthermore, as $w_{ij} = w_{ji}^{-1}$, Saati suggested that in practice, only $a_{ij}, j > i$ need to be assessed. Since A is founded as an approximation of W , when the consistency conditions are almost satisfied for A , one would expect that the normalized eigenvector corresponding to the maximum eigenvector of A , denoted by λ_{max} , will also be close to w .

If we have q objectives and we want to construct a scale which rates these objectives as to their importance with respect to the decision as seen by the analyst, we ask the experts to compare the objectives in paired comparisons. If we are comparing objective i to objective j , we assign the values a_{ij} and a_{ji} as follows $a_{ij} = a_{ji}^{-1}$. If objective i is more important than objective j , then a_{ij} is determined by Table 1. The scale of priorities is composed of the interval from 1 to 9 (Saati 1980).

Table 1. The fundamental scale for pairwise comparisons

Intensity of importance	Definition	Explanation
1	Equal importance	Two elements contribute equally to the objective
3	Moderate importance	Experience and judgment slightly favor one element over another
5	Strong importance	Experience and judgment strongly favor one element over another

Intensity of importance	Definition	Explanation
7	Very strong importance	One element is favored very strongly over another, its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one element over another is of the highest possible order of affirmation

Source: Saati 1980.

Aside from determining the relative weight, the overall consistency should be checked. The normalized principal eigenvector is also called the *priority vector*. Since it is normalized, the sum of all elements in the priority vector is 1. The priority vector shows relative weights among the things that we compare. To measure consistency, which is called the *Consistency Index (CI)*, as a deviation or degree of consistency, we use the following formula:

$$CI = \frac{\ddot{e}_{\max} - n}{n - 1} \quad (12)$$

Then the *Consistency Index* should be compared with the *Random Consistency Index (RI)*, which is calculated by random generation of a reciprocal matrix using the scale 1/9, 1/8, ...1/2, 1, ..., 8, 9 (similar to the bootstrap idea). The average random consistency index of a sample of 500 matrices is shown in the table below.

Table 2. Random Consistency Index *RI*

<i>n</i>	1	2	3	4	5	6	7	8	9	10
<i>RI</i>	0	0	0,58	0,9	1,12	1,24	1,32	1,41	1,45	1,49

Source: Saati 1980.

So the *Consistency Ratio (CR)*, which is calculated by the following formula, is a measure of consistency of the concrete data.

$$CR = \frac{CI}{RI} \quad (13)$$

For the consistency to be acceptable, the ratio between the *CI* and the *RI* (*Random Index*) must be less than 0,1.

Data and practical application

To gather data for our research, we conducted a survey among human resource development specialists – representatives of the HR departments of Ukrainian IT companies who played the role of experts for the AHP method. The survey

was performed in the form of a questionnaire in which experts had to compare factors of RIDPC. The questionnaire was distributed to more than 120 companies and the current number of qualitative responses comes from 32 companies. The population of the current study is distributed as following: 50% of companies had under 80 employees, 13% of companies from 80 to 200 employees, 22% of companies from 201 to 800 employees, and 15% companies with more than 800 employees.

In the framework of this research, we aim to determinate which kind of RIHPC is the most dangerous for the IT sector. To do this, we should find the weights constructing the matrices for the pairwise comparison. The results of the averaged weights of each kind of risk are presented in Table 3.

Table 3. First level of the hierarchy: weights of risks

<i>Risk</i>	<i>w</i>
Premature leaving	0,19
Ineffective training	0,26
Wrong development strategy	0,23
Risk of non-investment	0,32
CI	0,01
CR	0,02

Source: own elaboration.

According to the table, the most significant risks are the „risk of non-investment” (0,32) and „risk of ineffective training” (0,26) that are both related to the firm. Surprisingly, the „risk of premature voluntary termination” has a weight of only 0,19 points. The consistency ratio (*CR*) is 0,02, which is less than 0,1, meaning that the results are acceptable.

Table 4. Second level of the hierarchy: weights of factor related to employee

<i>Risk</i>	<i>w</i>
Motivation	0,25
Work performance	0,27
Competencies	0,25
Personal reasons	0,23
CI	0,04
CR	0,04

Source: own elaboration.

According to the analysis of risk factors related to the employee, the factors of „work performance”, „motivation”, and „competencies” have almost the same weights of importance, 0,27, 0,25 and 0,25 points respectively. The factor of „personal reasons” has a weight of 0,23 points. The results from this pairwise comparison are also acceptable in this case with the $CR = 0,04$, which is less than 0,1.

Table 5. Second level of the hierarchy: pairwise assessment of risk factors related to a company

<i>Factors</i>	<i>w</i>
Staff development system	0,08
Consistency of strategies	0,15
Salary	0,14
Corporate culture	0,09
Interesting work and projects	0,23
Team	0,18
Career opportunities	0,13
CI	0,14
CR	0,11

Source: own elaboration.

Regarding internal factors of the company, there is a high role of the factor of „interesting projects” – 0,23 points. The factors of „team”, „consistency of strategies”, „salary”, and „career opportunities” have a weight of 0,18, 0,15, 0,14, and 0,13 respectively. At the same time, the factors of „personnel development system” and „corporate culture” have relatively small weights. The consistency ratio for these factors is slightly above the boundary of acceptability (0,11).

Table 6. Second level of the hierarchy: pairwise assessment of risk factors related to external environment

<i>Risk</i>	<i>w</i>
Economic and political situation	0,18
World changes	0,08
Competitors	0,21
IT sector situation	0,21
Training providers	0,08
Technology development	0,23
CI	0,04
CR	0,03

Source: own elaboration.

Regarding the external environment, one of the most dangerous risk factors is „technology development” (0,23), while the „competitors” and „IT sector situation” factors have the same weights – 0,21 points. The factor of „economic and political situation” has a relatively high weight of 0,18 points, which is easy to explain by the influence of the severe crisis in Ukraine during 2014–2015. The results from this group pairwise comparison are also acceptable in this case, with the $CR = 0,03$, which is less than 0,1.

Conclusions

The results show that IT companies mostly invest in the development of their workers, although several choose the strategy of hiring only already qualified personnel. Moreover, according to the survey, the „risk of non-investment” has a relatively high level (0,32), which underlines the importance of wise and accurate investments in staff development.

The main advantage of the presented method is the possibility to conduct a quantitative measurement of risk. It significantly differentiates the method from other existing theoretical approaches. Furthermore, evaluating the factors that influence a risk can assist in the deep analysis of a firm’s performance in the human resource function.

The presented method allows all the main factors that affect the risk of investment in the human capital of a company to be taken into consideration. This gives a basis for further research in this field and allows for the creation of a practical framework for making decisions regarding the personnel development strategy and specific employees’ development plans for the HR departments. Moreover, the method presented in the article can be easily applied to other sectors of the economy due to its simplicity and the possibility to choose and set factors which are relevant to those sectors.

Finally, as we have collected only a relatively insignificant number of expert opinions so far, the provided results of the weight calculations should be viewed only as examples of how the method works. A further study involving large-scale data collection and analysis that will include a magnitude more Ukrainian IT companies is planned in order to achieve more statistically valid outcomes.

References

- Becker G., *Investment in human capital: A theoretical analysis*, „Journal of Political Economy”, 70(5) Part 2, Chicago 1962.
- Bhattacharya M., Wright P., *Recognizing risk in human capital investments: A real options approach to strategic human resource management*, Cornell University ILR School, New York 2000.

- Dobrynin A., Dyatlov S., Tsyrenova E., *Human capital in transition economy: Formation, evaluation, and effectiveness of usage*, „Nauka”, St. Petersburg.
- Fitz-enz J., *The ROI of human capital: Measuring the economic value of employee performance*, Vershyna, Moskow – St. Petersburg 1999.
- Economic Forum: *The human capital report 2013*, www.reports.weforum.org/human-capital-index-2013/.
- Exploring Ukraine: *IT outsourcing industry 2012 report*, www.hi-tech.org.ua/wp-content/uploads/2012/08/Exploring-Ukraine-IT-Outsourcing-Industry-20121.pdf (date of access: 22.02.2015).
- Grishnova O., *Human capital: Forming in the educational system and professional training*, Znannya, Kyiv 2001.
- Gryzina I., *Transformation of approach to labor motivation in the condition of information economics*, „*Ekonomika rozvytku*” (1)2014, Kharkiv.
- Hashimoto M., *Firm-Specific Human Capital as a Shared Investment*, „*The American Economic Review*” 71(3), Nashville 1981.
- Huselid A., *The impact of human resource management practices on turnover, productivity, and corporate financial performance*, „*Academy of Management Journal*” 38(3) 1995.
- Koerselman K., Uusitalo R. (2013), *The Risk and Return of Human Capital Investments*. IZA Discussion Paper No. 7752, <http://ssrn.com/abstract=2363239> (date of access: 12.01.2015).
- Levhari D., Weiss Y., *The effect of risk on the investment in human capital*, „*The American Economic Review*” 64(6) 1974.
- Mincer J., *Investment in human capital and personal income distribution*, „*Journal of Political Economy*” 66(4) 1958.
- Palianytsia V., *Substantiation of factors and sources of risks of engineering enterprises*, „*Halytskyi ekonomichnyi vistnyk*” 1(26) 2010.
- Posokhov I., *Analysis of risk category and scientific approaches to determination of risk*, „*Visnyk natsionalnoho technichnoho universytetu KhPI*” No. 5, Kharkiv 2012.
- Saaty T., *The analytic hierarchy process: Planning, priority setting, resource allocation*, McGraw-Hill, New York 1980.
- Silicon Valley Bank, *Innovation Economy Global Outlook Report 2014*, www.svb.com/pdfs/ieo/SVB_IEO_Global_Report_2014.pdf (date of access: 30.03.2015).
- Serguieva A., Hunter J., *Fuzzy interval methods in investment risk appraisal*, *Business Research Quarterly*, (17) 2013.
- Schultz T., *Investment in human capital*, „*The American Economic Review*” 51(1) 1961.
- Startup Outlook Report 2013, www.svb.com/startup-outlook-report (date of access: 22.02.2015).
- Ye S., Tiong, R., *NPV-at-risk method in infrastructure project investment evaluation*, *J. Constr. Eng. Manage.* 126(3) 2000.

Zakharova O., *Management of investment in human capital: Methodology, estimation, planning*, DonNTU, Donetsk 2010.

Zaklekta O., *Investment in development of a personnel at the Ukrainian enterprises*, „Svit finansiv” No. 1 2007.

Summary

In this paper, we examine key factors that influence the risks of investment in the development of human capital of a firm in the IT sector and estimate their weight in the overall risk. In particular, we single out the risk of premature voluntary termination of an employee, the risk of ineffective training, and the risk of a firm's incorrect employee development strategy. Moreover, to support management of the mentioned kinds of risks, we enumerate the factors that influence them and classify those factors into three main groups: related to the employee, related to the firm, and related to the external environment. Based on this division, we build a model for estimating the risks of investing in the development of personnel using the Analytic Hierarchy Process (AHP).

Key words: investment, staff development, analytic hierarchy process, risk assessment, risk factor

JEL: J24, C13, C83, C51