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MODELING THE RETURN ON INVESTMENT IN HUMAN CAPITAL IN THE IT INDUSTRY OF UKRAINE

Purpose. To identify patterns of return on investment in human capital in the IT industry of Ukraine through a quantitative assessment of the relationship between the income of IT specialists and the experience and other characteristics of the specialist and the company, as well as the formation of relevant recommendations.

Methodology. The empirical basis of the study was a survey on the salary of IT specialists in Ukraine conducted in December 2022. The methodological basis of the study was general scientific and special research methods, in particular, the method of abstraction (to focus on the main determinants of the formation of IT specialists' income), induction (to extrapolate the patterns found in the sample to the entire IT industry of Ukraine), economic mathematical modeling (for the construction of a multiple regression model that reflects the patterns of influence of factors on the income of IT specialists that exist in reality).

Findings. It was established that among IT specialists people are predominant with little work experience (up to 5 years). The effect of experience on the growth rate of income has a decreasing non-linear nature, while the most noticeable increase in income is observed during the first years of work in the specialty. It was found that the highest-paid IT professionals are software development engineers, managers at various levels, and quality assurance engineers. It has been proven that the level of English proficiency has a positive effect on income. A higher level of remuneration for the work of IT specialists in product companies and startups compared to outsourcing or outstaffing companies has been established.

Originality. It has been revealed that the relationship between the income of IT specialists and their work experience, profession, level of English language proficiency, and company type.

Practical value. The applied value of the study lies in the ability to predict the income of IT specialists. The formed recommendations can be used in the activities of IT companies in terms of improving financial control over the spending of funds for the payment of services of IT specialists, assessing the feasibility of investing funds in personnel development, as well as substantiating the planned indicators of changes in the costs of paying for the services of IT specialists.

Keywords: *IT industry, regression, human capital, income, wages, investments*

Introduction. The Ukrainian IT sector is one of the most promising spheres of the national economy in the context of overcoming the consequences of the military conflict. The active development of the area, the main driver of which is human capital, determines the need for an increase in the number of IT specialists. High salaries, professional growth prospects, and flexible work schedules attract young people and specialists from other areas to start their careers in IT.

At the same time, this type of business in Ukraine is characterized by fragmentation and closeness. Due to the complex (compared to the leading countries of the world) system of business regulation, IT sphere in Ukraine is mostly represented in the form of several juridically separated legal entities and individuals. According to the data of the State Statistics Service of Ukraine as of April 1, 2023, 16,546 legal entities with the main type of economic activity, belonging to Section 62 of the NACE "Computer programming, consulting, and related activities", were registered [1]. At the same time, according to the TechEcosystem portal [2] in Ukraine there are only 1,617 product companies and 535 service companies.

In addition, one of the latest studies on the activities of national IT companies showed that the predominant organizational and legal form of business is limited liability companies, and the business itself is focused on internal sources of financing. Given this, shortly information about the activities of enterprises will remain closed, which will complicate scientific research in this field.

This also applies to the information about human capital. In Ukraine, the practice of referring information on employee salaries and expenses for the services of subcontractors as a commercial secret is established by signing a non-disclosure agreement (NDA). Thus, due to the restriction of access to information on the amount of monetary reward for the work performed, the mobility of human capital is slowed down. This, in turn, also directly affects the results of business activities and the strengthening of the influence of competitors.

In addition, the described problem is complicated by the legal aspects of registration of relations with employees in the industry. According to the study, 76 % of specialists cooperated with IT companies not as full-time employees but as individual entrepreneurs (usually it is the third group of single taxpayers, paying 5 % of the income and the minimum single insurance contribution) [3]. Given this, when comparing wages, it is necessary to take into account payments in favor of the state and possibly obtaining additional benefits (medical insurance, compensation for attending gyms, foreign language courses and professional courses, partial compensation for the cost of renting housing).

Literature review. The study on the return on investment in human capital level in the field of Information Technologies has caused a great interest of scientists and is still of significant importance to them.

According to the results of bibliometric analysis, it was found that the following publications were devoted to the issue of studying the salary level:

1. "The Determinants of Information Technology Wages", which studies the impact of various factors on the com-

pensation of IT professionals. Dividing the IT salary by high and low (less than 75,000 US dollars and more accordingly) and using binomial logistic regression analysis, it was found that the most important factors associated with high salaries are management positions, IT experience, education, and size of the organization [4].

2. "Human Capital Investments and Employee Performance: An Analysis of IT Services Industry", the authors of which revealed a significant positive impact of training on the productivity of IT specialists. At the same time, the uniqueness of the nature of knowledge and skills in the subject area is emphasized, which over time are being atrophied and highly experienced workers receive a higher return from training [5].

3. "IT Service Management Employee Compensation: Determinants and Outcomes", the authors of which have developed a model for the relationship between human capital factors, such as educational qualifications, employee remuneration, employee performance, and organizational factors [6].

4. "Investigating the determinants of starting salary of IT graduates", dedicated to the study on gender and national inequality in wages among IT specialists. Scientists have found that men in IT spheres get more than women (partly because women are less likely to work in IT after graduation than their male counterparts), and foreign graduates are more likely to get a job in IT, but their starting salaries are lower than those of local graduates [7].

5. "On the value of formal IT education in early IT careers: A multilevel analysis", which revealed that at the beginning of their career IT professionals with formal IT education receive higher salaries than IT specialists at the beginning of their careers with non-IT education [8].

6. "It Pays to Be Agile", which proves that employees with agile soft skills receive a greater return on investment in human capital. This return differs according to the position [9].

7. "On the Value of Formal IT Education in Early IT Careers: A Multilevel Analysis", the authors of which found that IT professionals with formal IT education receive higher salaries than IT professionals who do not have IT education. In addition, it has been established that experience in IT complements the formal IT education in determining the salary of IT specialists at the beginning of their careers [10].

8. "The Relationship between Work Experience and Employee Compensation: A Case Study of the Indian IT Industry", in which, on the example of salaries of business analysts, database administrators, and system administrators, the influence of experience and positions on the level of remuneration in the IT sphere of India was revealed [11].

9. "Salary prediction in the IT job market with few high-dimensional samples: A Spanish case study", whose authors, using machine learning methods, found that the salaries of IT specialists in Spain are significantly influenced by such factors as experience, stability of work and role (position), and, to a lesser extent, education [12].

10. "Differences in Wage Level of First Time IT Workers Based on the Interaction Between Employment Type with Job Search Path and Company Type", the results of which revealed the existence of wage differences depending on the type of employment and the way of job search, as well as the type of the company [13].

11. "Paying to Program? Engineering Brand and High-Tech Wages", which shows that companies which are focused on the use of the latest technological innovations offer higher compensation to their employees. It also proved the economic feasibility of more active implementation of new technologies in the IT sphere [14].

12. "Information Technology Skills and Labor Market Outcomes for Workers", which found that the presence of advanced IT skills enables employees to get higher wages and increases the likelihood of receiving higher paying jobs [15].

13. "Machine Learning to Evaluate Important Human Capital (HC) Determinants Impacting IT Compensation", the results of which, on the example of India, showed that the most important determinants of compensation for IT specialists are the experience, educational institution that a specialist has graduated from, level of education and a set of skills owned by a person [16].

14. "Impact of intellectual capital on profitability: Evidence from software development companies in the Slovak Republic", in which the authors viewed human capital as a component of intellectual equity, and the positive impact of investment in human capital on the profitability indicators of Slovak IT companies was revealed [17].

15. "Dissecting the compensation conundrum: a machine learning-based prognostication of key determinants in a complex labor market", which empirical results assert that the main, but not the only determinants, defining the level of wages, are the level of experience, education and a specialized skill set (at the same time, the influence of the article, as well as the type and size of the company is statistically insignificant) [18].

It should be noted that the basis of most of these publications is the model proposed by Mincer J. in 1958 in the article "Investment in Human Capital and Personal Income Distribution" in the "Journal of Political Economy".

The model, often referred to in the English-language literature as Mincer earnings function, is formalized as a single equation that explains salary income as a function of learning and experience

$$\ln(w) = \ln(w_0) + p \cdot s + \beta_1 \cdot x + \beta_2 \cdot x^2 + \varepsilon,$$

where w is wages; w_0 – wages of a person without experience and education; s – the number of years of study; x – the number of years of experience; ε – errors of the model.

According to this, coefficients p, β_1, β_2 are used as a return on learning and experience.

Based on the available data on the relevant issue, the researchers add other variables to the model, including gender, age, etc.

Unsolved aspects of the problem. According to the results of the study of the current state of scientific research on the assessment of the salary level, it was found that the use of modern methodology for researching the return on investment in human capital in the IT sphere of Ukraine was not carried out. This would allow one, based on empirical data, to identify patterns that affect the size of employee income and make a forecast of income for a candidate with specific experience, education, and other characteristics. It can be used both in the search for work by specialists and for the planning of business costs in Ukraine.

Purpose. The article is aimed at identifying the patterns of return on investment in human capital in the IT sphere of Ukraine through a quantitative assessment of the interconnection of IT specialists' income from experience and other characteristics of a specialist and a company, as well as the formation of appropriate recommendations.

Methods. The empirical basis of the study was a survey on the salary of IT specialists in Ukraine conducted in December 2022 on the DOU portal [19], regarding the salary of IT specialists in Ukraine. Respondents were asked to indicate the wage rate in US dollars after payment of taxes and other data (general experience in the specialty, position, level of English, type of companies, etc.). We assume that when asked about the size of the rate, respondents indicated the size of the rate which did not include health insurance compensation, English language courses, and other benefits.

The original sample was adapted to carry out this study by including data on the salary of full-time workers. Thus, the wages of part-time workers, freelancers, and temporarily non-working persons were not considered. At the same time, the sample included answers not only from specialists from Ukraine, but also from people who moved abroad because of the war, but also planned to return.

The non-numerical values of the experience were transformed to numerical ones, in particular if the person indicated

that he/she had "less than 3 months" of experience, the value of the variable was equated to 0, and in the case of "15 years or more" of experience – to 15.

The adjusted sample consisted of responses of 12,618 people, which made up about 4 % of the total population (according to the estimates of the IT Association of Ukraine, the number of IT talents in Ukraine as of 01.11.2022 amounted to 329.2 thousand people [4]).

The methodological basis of the study was general scientific and special research methods, in particular, the method of abstraction (to focus on the main determinants of the formation of IT specialists' income), induction (to extrapolate the patterns identified in the sample to the entire IT sphere of Ukraine), economic and mathematical modeling (to build a multifactorial regression model, that reflects the patterns, existing in reality, of influence of factors on the amount of payment for IT specialists' services).

The corresponding calculations were carried out in the econometric package Gretl.

Results. Human capital is considered as a set of knowledge and skills belonging to man and can be used in economic activity. According to this, the income of a particular specialist is a dependent variable on his/her human capital. At the same time, in the IT industry, human capital is characterized by the following features:

1) since IT business is not usually tied to certain physical objects, it is human capital that plays a leading role, and, as a result, labor costs of employees or contractors constitute the bulk of the costs of this type of business;

2) due to the significant influence of the Internet and technology on the industry, as well as the possibility of remote work, the edge between the format of cooperation "company (employer) – specialist (employee)" and "company (customer) – specialist (independent contractor)" is blurred;

3) human capital in the industry is characterized by an extremely high level of mobility, since the company and specialist can be located in different countries, and even cooperate in asynchronous mode (due to the difference between time zones), and this, in turn, expands the range of potential specialists with whom companies can cooperate and vice versa. It results in a very high level of competition in the labor market, and at the same time there are almost no restrictions on the amount of remuneration, which can be claimed by an IT specialist;

4) the work of the vast majority of IT specialists can be easily represented as a certain standardized service that can be quickly provided to the client (for example, software development, its design or testing, management of the process of such development);

5) it is important to combine the technical and communication skills of specialists in the field, since the creation and support of IT projects is carried out, as a rule, by a team of specialists of different profiles, interacting in a limited time, budget and scope of work;

6) the depreciation of human capital in the industry is very fast because, through the dynamic process of technology development and approaches to the management of IT projects, skills and knowledge require constant updating to meet the needs of the market.

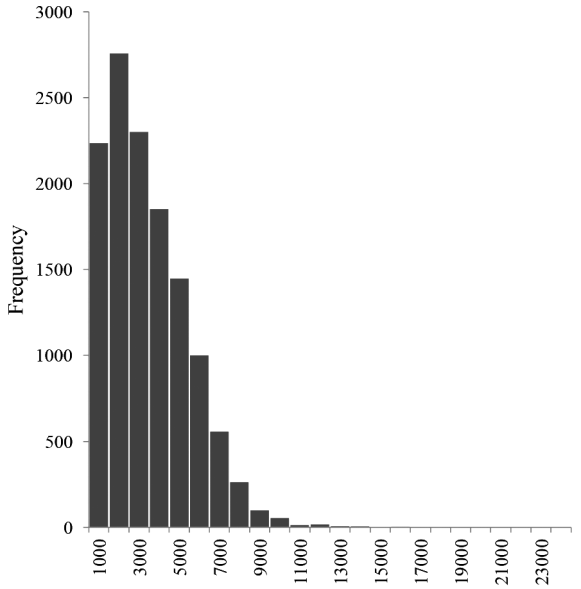

Fig. 1. Distribution of salaries of the polled IT specialists in USD [19]

The distribution of salaries of the polled IT specialists has a clear shift to the left, which indicates that the vast majority of specialists receive relatively small wages, while a small part receives a significant return from their human capital (Fig. 1). In particular, 37 % of the highest paid respondents receive 63 % of the total salary, while 63 % of the less paid specialists receive only 37 % of the total salary.

According to the results of the analysis of the positions at which the surveyed specialists work, 52 % belong to the software development engineers (Software Engineer) of all levels (including technical and executive directors of IT companies), 18 % – to the quality assurance engineers (QA Engineer) and 6 % – to the managers of various directions (Project/Product/Program Manager, Product Owner, Scrum Master, Delivery Manager). Thus, more than ¾ of the respondents belong to these 3 job categories only.

Up to 50 % of software engineers surveyed, received up to 3,500 USD, quality assurance engineers – 2,000 USD, and the managers – 2,800 USD (Table 1). These median and average salary values of IT professionals are many times higher than the average values of salaries at the end of 2022 in the Ukrainian economy, which were determined by the State Statistics Service at the level of 450 USD (converted at the official exchange rate of the National Bank of Ukraine) [20].

Based on the data on the experience of specialists, 60 % of respondents have 1 to 5 years of experience, and the average age was 30 years, which characterizes the industry with a predominant proportion of young people. At the same time, up to 50 % of the polled specialists without work experience received up to 800 USD, with experience of 1 year – 950 USD, with experience of 3 years – 2,500 USD, with 5 years of experience – 3,500 USD, with 10 years of experience and more than 15 years of experience – 4,800 USD and 4,500 USD respectively (Table 2).

At the same time, 87 % of respondents had a university degree (including 1.5 % of people who had a PhD or Doctor of Science degree), and another 6 % were in the process of obtaining higher education. As a rule, students begin to work while studying at higher educational institutions, so the level of education correlated with work experience.

Table 1

Statistical indicators of salaries of the polled IT specialists depending on the position, USD [19]

Indicator	Software Engineer	QA Engineer	Manager	Others
Min	100	130	200	80
Median	3,500	2,000	2,800	1,800
Max	19,500	12,000	10,300	16,000
Mean	3,671	2,298	3,002	2,295
SD	2,163	1,480	1,695	1,799
Obs.	6,589	2,263	785	2,981
% of Sample	52	18	6	24

Notes: Min – is the minimum value, Median – is the median value, Max – is the maximum value, Mean – is the mean value, SD – is the standard deviation, Obs. – the number of observations, % of Sample – the proportion of observations in the sample.

Table 2

Statistical indicators of salaries of the polled IT specialists depending on experience, USD [19]

Indicator	Less than 3 months	1 year	2 years	3 years	5 years	10 years	15 or more years
Min	100	225	2	3	5	10	220
Median	800	950	1,767	2,500	3,500	4,800	4,500
Max	10,000	8,500	12,000	9,000	13,200	16,000	16,000
Mean	1,752	1,169	75	2,603	3,713	4,649	4,618
SD	1,809	902	1,166	1,295	1,708	2,215	2,351
Obs.	397	874	1,360	1,537	1,293	561	547
% of Sample	3	7	11	12	10	4	4

Notes: Min – is the minimum value, Median – is the median value, Max – is the maximum value, Mean – is the mean value, SD – is the standard deviation, Obs. – the number of observations, % of Sample – the proportion of observations in the sample

Knowledge of English is one of the mandatory conditions for work, so it is expected that 88 % of respondents spoke English at the Intermediate level or Upper-Intermediate and Advanced.

As for the type of companies, 56 % of respondents worked in outsourcing and outstaffing companies, and 37 % in product companies, which generally reflects the ratio of product to service companies in Ukraine.

To confirm the assumption of the existence of a relationship between the size of income of IT professionals with experience in their work, position, knowledge of English and the type of a company, a model of linear regression was used. At the same time, as a dependent value for the construction of an economic and mathematical model, a natural logarithm of the income of an IT specialist ($\ln w$) was determined.

The factors used were the total experience in the specialty (exp) and its square ($\exp^2$), as well as a number of dummy-variables that characterize:

1) position:

- *Position: Software Engineer* – for software development engineers;
- *Position QA Engineer* – for quality assurance engineers;
- *Position: Manager* – for managers of different fields;
- *Position: Other* – for other categories of specialists, in particular business and data analysts, personnel specialists, sales specialists, designers;

2) level of English language proficiency (*English: Elementary, English: Pre-Intermediate, English: Intermediate, English: Upper-Intermediate and English: Advanced*);

3) Company type:

- *Company*: *Product* – for product companies;
- *Company*: *Outsource* – for outsourcing companies;
- *Company*: *OutStaff* – for outstaffing companies;
- *Company*: *StartUp* – for startups;
- *Company*: *Other* – for other types of companies.

The basic version of the model was the software developer, with an advanced level of English, working in an outsourced company. Based on this, the economic-mathematical model has the following appearance

$$\ln(w) = \ln(w_0) + \beta_1 \cdot \exp + \beta_2 \cdot \exp^2 +$$
$$+ \beta_3 \cdot \textit{Position: QAEngineer} + \beta_4 \cdot \textit{Position: Manager} +$$
$$+ \beta_5 \cdot \textit{Position: Other} + \beta_6 \cdot \textit{English: Elementary} +$$
$$+ \beta_7 \cdot \textit{English: PreIntermediate} + \beta_8 \cdot \textit{English: Intermediate} +$$
$$+ \beta_9 \cdot \textit{English: UpperIntermediate} + \beta_{10} \cdot \textit{Company: Product} +$$
$$+ \beta_{11} \cdot \textit{Company: OutStaff} + \beta_{12} \cdot \textit{Company: StartUp} +$$
$$+ \beta_{13} \cdot \textit{Company: Other} + \varepsilon.$$

To assess the level of multicollinearity, we have built 13 auxiliary multifactor regression models, reflecting the dependence of each factor on the others in the main model, determined the determination coefficient for each model (R^2), and calculated the value of the variance-inflation factor (*VIF*).

The results of the calculations, given in Table 3, state that there is no multicollinearity between the factors in the main model since the values of the variance-inflation factor do not exceed the critically established value (*VIF* = 10). The exception is the exp and $\exp^2$ variables, but the relationship between them by definition is not linear.

To achieve this goal, the following hypotheses were put forward:

Hypothesis 1. (H_1). The change in experience in the specialty influences (under other equal conditions) the change in the rate of income growth (H_1: $\beta_1 \neq 0$ or $\beta_2 \neq 0$). It is expected that between the growth of work experience and income growth, there is a non-linear relationship, according to which income increases to a certain maximum of growth (under other equal conditions).

Hypothesis 2. (H_2). The position of an IT specialist (other things being equal) affects the change in income (H_2: $\beta_3 \neq 0$ or $\beta_4 \neq 0$ or $\beta_5 \neq 0$). It is expected that due to the specifics of IT business, software engineers will have the largest income.

Hypothesis 3. (H_3). The level of English proficiency (other things being equal) affects the change in income (H_3: $\beta_6 \neq 0$ or $\beta_7 \neq 0$ or $\beta_8 \neq 0$ or $\beta_9 \neq 0$). It is expected that specialists with a higher level of proficiency in this language receive higher incomes.

Hypothesis 4. (H_4). Company type (other things being equal) affects the change in income (H_4: $\beta_{10} \neq 0$ or $\beta_{11} \neq 0$ or $\beta_{12} \neq 0$ or $\beta_{13} \neq 0$). It is expected that from specialists working in product companies will have a higher income.

The least squares method was used to construct the model, with a correction to heteroscedasticity in the sample data.

The results of the regression analysis (Table 4) provide an opportunity to conclude about the significance of the model parameters and their adequacy. In particular, the adjusted value of the coefficient of determination (Adjusted R^2 = = 0.555153) is close to the critically acceptable minimum value

Table 3

R^2 and *VIF* values for auxiliary multifactor regression models

Dependent variable	R^2	*VIF*
exp	0.9064	10.688
$\exp^2$	0.9049	10.518
Position: QAEngineer	0.1182	1.134
Position: Manager	0.0859	1.094
Position: Other	0.1394	1.162
English: Elementary	0.1357	1.157
English: Pre-Intermediate	0.4236	1.735
English: Intermediate	0.6222	2.647
English: Upper-Intermediate	0.6231	2.653
Company: Product	0.1770	1.215
Company: OutStaff	0.1372	1.159
Company: StartUp	0.0512	1.054
Company: Other	0.0654	1.070

but remains statistically significant at level 0.001. This gives grounds to assert that the change in the income of IT specialists by 56 % is determined by the change of factors taken into account in the model.

The basic income of the software developer, with a high level of English, working in an outsource company, but does not have experience, on average is 1,329 USD.

At the same time, hypothesis 1 was confirmed. Between the annual growth of income and experience there is a nonlinear connection. The rate of income growth increases with each additional year of experience, until the specialist receives 10 years of experience, after which the income is no longer growing. In particular, compared with the rate that the specialist received at the beginning of work, on average, after the first year of work, it increases by 1.34 times, and after the second by 1.73 times, after the third by 2.18 times (under other equal conditions).

Hypothesis 2 was also confirmed regarding the influence of the position on the size of income. Thus, compared with software engineers, in other equal conditions, quality assurance engineers receive 26.6 % less, managers of different spheres receive 17.9 % less, and the rest of the specialists – 34.0 % less.

In addition, hypothesis 3 was confirmed, according to which specialists who speak English at the elementary level receive 52 % less, at the level below the average – by 42.7 %, at the average level – by 26.0 %, at the level above the average – by 7.2 % compared to the colleagues with the high level (with other equal minds).

In addition, the influence of the company type on the amount of income was revealed, according to which, compared with outsourcing companies in grocery companies, they pay 10 % more, outstaffing companies – by 7.4 %, startups by – 9.9 %, and other types – by less than 32.5 % under other equal conditions. Hypothesis 4 has also been confirmed.

Conclusions. Based on the survey of IT specialists in Ukraine conducted in December 2022, the amount of income of specialists in this field is one of the largest in Ukraine.

The use of the economic and mathematical modeling tools to quantify the impact of work experience, position, knowledge of English and the type of a company on the size of income made it possible to form such conclusions.

Firstly, IT professionals are dominant by people with little experience (up to 5 years). It is during the first years of work in the specialty that the most noticeable increase in income is observed (on average, for 5 years, income can grow more than three times), which, in turn, attracts an increasing number of talents, both without experience in IT and with experience in other industries. At the same time, after 10 years of work (under other equal conditions), income ceases to grow, reaching its maximum.

Secondly, software engineers are dominant among IT specialists, who receive the highest income under other equal conditions. The next income category of positions are managers of different spheres and engineers for quality assurance. At the same time, there is the influence of barriers to entry into the profession on the full salary rate. So, the highest ones are the entry barriers for software engineers, where knowledge of programming languages, the latest technological changes and English are required. Relatively less demanding are the conditions for managers, where knowledge of English is required (for communication with clients), the presence of managerial experience (for organizing and planning the team's work and tracking progress) and knowledge of the specifics of the software development process.

Thirdly, the level of English language proficiency, which is, by default, the main language of communication in this industry and is considered as one of the key soft skills of IT specialists, has a positive effect on the rate of income growth (under other equal conditions).

Fourthly, there is a tendency that in product companies and startups the amount of income is higher compared to outsourcing or outstaffing companies under other equal conditions. This is due to the fact that the creation of high added value, which takes place in the creation or system production of digital products, requires the involvement of more qualified specialists for a longer period, compared with the provision of services of individual IT specialists or teams.

The revealed patterns can be used in the practical activities of IT companies in the part of:

1) improvement of financial control over the expenditure of funds for the payment of labor or services of its specialists by the following algorithm:

- calculation of a 95 % confidence interval based on the model to forecast the amount of income of IT specialists, taking into account their profession and work experience. At the same time, for specialists with the status of private entrepreneurs, work experience can be determined based on the date of

Table 4

Results of regression analysis

	Coefficient	Std. Error	t-ratio	p-value	
const	7.19210	0.0221119	325.3	<0.0001	***
exp	0.304005	0.00473426	64.21	<0.0001	***
exp^2	–0.0149379	0.000310816	–48.06	<0.0001	***
Position: QAEngineer	–0.308879	0.0121796	–25.36	<0.0001	***
Position: Manager	–0.196951	0.0213354	–9.231	<0.0001	***
Position: Other	–0.415031	0.0132337	–31.36	<0.0001	***
English: Elementary	–0.734279	0.0481912	–15.24	<0.0001	***
English: Pre-Intermediate	–0.556292	0.0216059	–25.75	<0.0001	***
English: Intermediate	–0.300910	0.0166834	–18.04	<0.0001	***
English: Upper-Intermediate	–0.0744712	0.0156315	–4.764	<0.0001	***
Company: Product	0.0957089	0.0103833	9.218	<0.0001	***
Company: OutStaff	0.0714294	0.0139337	5.126	<0.0001	***
Company: StartUp	0.0944978	0.0287294	3.289	0.0001	***
Company: Other	–0.393683	0.0394234	–9.986	<0.0001	***
Mean dependent var	7.765737	S.D. dependent var		0.779043	
Sum squared resid	3,402.849	S.E. of regression		0.519598	
R-squared	0.555611	Adjusted R-squared		0.555153	
F(13, 12604)	1,212.195	P-value(F)		0.000000	
Log-likelihood	–9,636.151	Akaike criterion		19,300.30	
Schwarz criterion	19,404.50	Hannan-Quinn		19,335.17	

their registration as a business entity listed in state registers;

- identification of transactions for payment of services of IT specialists, in which the amount of the transaction goes beyond the calculated confidence interval (in a bigger part);

- more detailed study on the operation for abuse or technical errors of operations;

2) assessing the feasibility of investing enterprise funds in the development of personnel for increasing English language proficiency and professional expertise compared with the search of new specialists in the market or use of services of third-party organizations;

3) justification of planned indicators of changes in costs for payment of IT specialists' services, taking into account changes in work experience and level of English language proficiency.

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Моделювання віддачі інвестицій у людський капітал в IT галузі України

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Мета. Виявлення закономірностей віддачі від інвестицій е людський капітал в IT галузі України через кількісну оцінку взаємозв'язку доходу від досвіду та інших характеристик спеціаліста й компанії, а також формування відповідних рекомендацій.

Методика. Емпіричною базою дослідження стало опитування щодо розміру заробітної плати IT-спеціалістів в Україні проведене у грудні 2022 року. Методологічною основою дослідження стали загальнонаукові та спеціальні методи дослідження, зокрема метод абстрагування (для фокусування на основних детермінантах формування доходу IT-спеціалістів), індукції (для екстраполяції виявлених у вибірці закономірностей на всю IT-галузь України), економіко-математичного моделювання (для побудови багатофакторної регресійної моделі, що відображає існуючі в реальності закономірності впливу факторів на розмір доходу IT-спеціалістів).

Результати. Встановлено, що серед IT-фахівців переважають люди з невеликим досвідом роботи (до 5 років). Вплив досвіду на темп приросту доходу має спадаючий нелінійних характер, при цьому саме протягом перших років роботи за спеціальністю спостерігається найбільш помітний приріст доходу. Виявлено, що найбільш високооплачуваними IT-спеціалістами є інженери з розробки програмного забезпечення, менеджери різних рівнів та інженери із забезпечення якості. Доведено позитивний вплив рівня володіння англійською мовою на розмір доходу. Встановлено більш високий рівень оплати праці/послуг IT-спеціалістів у продуктових компаніях і стартапах у порівнянні з аутсорсинговими чи аустафінговими компаніями.

Наукова новизна. Полягає у виявленні взаємозв'язку між розміром доходу IT-спеціалістів і їх досвідом роботи, професією, рівнем володіння англійською мовою та типом компанії.

Практична значимість. Прикладне значення дослідження полягає в можливості спрогнозувати розмір доходу IT-спеціалістів. Сформовані рекомендації можуть бути використанні в діяльності IT компаній у частині вдосконалення фінансового контролю за витрачанням коштів на оплату послуг IT-спеціалістів, оцінки доцільності інвестування коштів у розвиток персоналу, а також обгрунтування планових показників зміни витрат на оплату послуг IT-спеціалістів.

Ключові слова: *IT галузь, регресія, людський капітал, дохід, заробітна плата, інвестиції*

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