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THE PLACE OF FINANCIAL INSTRUMENTS IN THE INTELLECTUAL CAPITAL MANAGEMENT SYSTEM OF AN ENTERPRISE

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ABSTRACT

The article examines the place and role of financial instruments in the intellectual capital management system at a modern industrial enterprise in the conditions of the transformational economy of Ukraine. The aim is to attempt to assess the impact of financial instruments on the system of managerial decision-making regarding the development of intellectual capital using the example of modern industrial enterprises of Ukraine, as well as to identify the most effective of them in the context of supporting the knowledge component of the economy. Based on theoretical principles and analysis of empirical data, a full-fledged multifactor correlation regression study was conducted. As part of the study, a system of dependent variables was formed that represent key aspects of the intellectual capital of the enterprise: R&D costs, the number of implemented innovations, the level of automation, the number of employees with higher education and investments in personnel training. The results of the analysis showed that the greatest positive impact on intellectual capital is exerted by tax benefits, state support and foreign direct investment. Instead, bank lending and leasing have a less pronounced or indirect effect.

Keywords: intellectual capital, financial instruments, industrial enterprise, knowledge management, multivariate regression, R&D, government support, tax breaks, investment, human resource potential

JEL Classification: O32, G32, M21, L60

INTRODUCTION

The modern economic development of industrial enterprises is analyzed from the perspective of the transformation from industrial to information paradigm of organization. In the realities of modernity, the basic elements of the new economy are information and knowledge, which are subject to the process of intensive capitalization, in particular within the framework of the theory of intellectual capital, which puts the issue of developing the theoretical and methodological foundations of intellectual capital in the rank of relevant ones. The development of the modern economy requires the state and enterprises to use their resources more effectively. As both foreign and domestic experience shows, the main resource is human capital. However, due attention is not paid to the process of formation and use of human capital in modern enterprises. One of the main issues remains investment in human capital, which will help not only to increase the efficiency of the enterprise but also of the state as a whole. The functioning of human capital in the socio-economic system goes through the phases of reproduction: formation, distribution, use and development. Reproduction cycles are associated with the costs of accumulating knowledge, maintaining health and preventing diseases, forming the spiritual makeup of the individual, acquiring special professional knowledge necessary for the enterprise, searching for and inviting specialists to work, investing in education, health and spirituality of children by parents, using modern means of communication, acquiring business connections, business trips, attending concerts and exhibitions. A special feature of human capital is its inseparability from its carrier. This feature has important theoretical and practical consequences. Over time and with the right management system, human capital turns into intellectual capital, which in turn has a much greater socio-economic effect. Intellectual capital is characterized by a

higher degree of development compared to the already known functional forms of capital, the criterion of which is a more stable level of economic growth of society, and the efficiency of its structures. Only an intellectually rich society is a guarantor of a high standard of living for the people and the prosperity of the state even in the absence of energy sources, minerals and other gifts of nature.

Intellectual capital management requires a system that would solve certain tasks: increasing the competitiveness of the enterprise in the market; systematic development of personnel; increasing the value of human resources; improving business processes; supporting management decisions in strategic, innovative, financial, technological and production management. The targeted development of intellectual capital, stimulating innovative developments, and measures for technical development through an effective intellectual capital management system allow the enterprise to obtain maximum profit and maintain high competitiveness in the market in a modern post-industrial economy. But all this is achieved precisely through appropriate financial instruments. The relevance of this study is that the realities of modern times determine a situation where all enterprises, regardless of the industry, understand the direct dependence of the dynamics of competitiveness on their ability to attract, develop and retain highly qualified specialists, as well as on their readiness to promptly respond to challenges of the external environment.

LITERATURE REVIEW

As Zelinska, Andrusiv and Simkiv (2020) note, the initial interest in intellectual capital was shown by psychologists who studied the principles of intelligence development through increased mental activity and the possibility of slowing down personal emotional state through more active use of personal intellectual resources. The results obtained interested economists since the complication of production technology without proper knowledge among employees did not make it possible to increase labour productivity. The constant carrier of intelligence is a person, therefore the implementation of intellectualization is purposeful, but at the same time complicated by the relationship between the employer and the employee, when due to a mismatch of interests such a process is stopped or, in the opposite case, gives the maximum effect exceeding the established guidelines.

At the same time, already at the initial questions of researching this concept, there was a need to establish how to financially support this process. Wu, Lin and Hsu (2007) and Gloet and Terziovski (2004) emphasize that the distinctive feature of the managing intellectual capital of an enterprise is the priority given to the implementation of measures related to the development of human capabilities in order to enable the generation of new knowledge with subsequent widespread application in practical activities. The financial component, which is determined by technical means and digital technologies, requires systematic updating but still has a lower priority (Yankovoi, Sembiyeva, 2023). The distinctive features of the managing intellectual capital program are: the duration of implementation due to the need for constant improvement of mental abilities; a high probability of a passive attitude and possible resistance from participants; the existence of a risk of ineffective investment in the development of human capital due to staff turnover.

At the same time, Akbar, Salam, Arsyad and Rahmadanih (2023) note that in fact, during COVID-19, the threat of the inability of enterprises that relied on the classical principles of conducting their own activities to continue their existence in the conditions of a growing share of the digital economy became clear, when the same pandemic created new opportunities to improve competitive positions primarily through the results of intellectual capital management systems. In their opinion, intellectual management is a continuous process that, regardless of the level of implementation, involves creating conditions (including through digital technologies) and stimulating the development of existing mental abilities with the subsequent use by each individual and the group within which he performs tasks, of personal and collective intelligence to generate new knowledge with its subsequent targeted application to achieve related interests. At the same time, the result of this continuous process depends on financial instruments.

Abdullah, L. (2013), using hierarchical analysis, proposes a methodology for ranking human capital indicators that can be used to assess the effectiveness of intellectual asset management. The role of knowledge creation processes in ensuring sustainable competitive advantages is described in the study of Kusumawijaya and Astuti (2024), where the authors emphasize the importance of institutionalizing creative ideas and their financial support.

Ali, Musawir and Ali (2018) highlight the fact that the growth of intellectual capital determines the ability to quickly and effectively implement measures that make it possible to continue achieving the goals that were defined at the stage of business creation. In the absence of progress, the gap between existing experience and the already excellent conditions for implementing security activities increases, which, in addition to an unjustified increase in resource needs, cannot ensure the implementation of priority tasks. Trends in the intellectual capital management system are most dependent on financial instruments. This is precisely a wide range of stakeholders, and not only financial security entities, which corresponds to

the modern paradigm of security activities, when, based on the coordination of interests, participation in security measures and security objects is the basic principle of their effective implementation.

Khumalo's (2017) study focuses on intellectualization through the development of terminology that demonstrates the breadth of application of the concept of intellectual capital not only in the production and economic sphere but also in the linguistic sphere.

In turn, Yemelyanov, Nikonenko, Sytnyk, Okhrimenko and Shulga (2022) provide a model for countering information and technical threats to intellectual capital management, emphasizing the growing role of information security as a component of the intellectual capital management system.

On the other hand, Hitka et al. (2019) emphasize the importance of human capital as a sustainable source of competitive advantage in the HRM system, considering it in close connection with the organization's development strategies. In addition, Sarra, Benabou and Tabeti (2013) emphasize the strategic dimension of human capital management, considering it as a significant factor in the formation of competitiveness. All these studies show that the issue of effective use of intellectual capital is extremely relevant worldwide, especially in the context of increasing innovation pressure and rapid technological change.

Summarizing the results of the review of scientific literature, we believe that the intellectual capital management system of an enterprise should be understood as a complex of organizational, economic and information mechanisms that, in their aggregate, contribute to the effective identification, assessment, formation of secure development and protection when using intangible assets (knowledge, innovations, brand, patents, human and structural capital) to increase competitiveness.

AIMS AND OBJECTIVES

The aim of the article is to assess the impact of financial instruments on the system of managerial decision-making regarding the development of intellectual capital using the example of modern industrial enterprises of Ukraine, as well as to identify the most effective of them in the context of supporting the knowledge component of the economy. The object of the study is precisely the direct processes of formation and management of intellectual capital at the level of industrial enterprises in the conditions of functioning of various financial instruments and sources of financing. The task is to conduct a correlation-regression analysis to identify the strength and direction of the impact of financial instruments on intellectual capital.

METHODS

It should be noted that our study used a multivariate correlation-regression approach, which allows us to identify and quantify the factors that influence decision-making regarding intellectual capital using various financial instruments. The adequacy of the models was checked through F-tests, estimation of the coefficients of determination (R^2, adjusted R^2) and analysis of residuals (in particular, for heteroscedasticity and autocorrelation). Standard errors and t-statistics determined the statistical significance of the influence of each factor. In addition, we introduced elements of comparative statistics and testing of qualitative assumptions. In particular, the methods of sample structuring and stepwise regression were used to clarify the contribution of each factor. We also implemented a sensitivity analysis to assess how the regression results change when removing individual observations (outliers) or when varying time intervals. The methodology results in a multifactorial assessment that combines statistical rigour (regression tests) and economic interpretation (reasonableness of variable selection) to provide a holistic view of the impact of financial instruments on the intellectual capital of modern industrial enterprises.

The paper uses a classical multiple linear regression model, which has the form (1):

$$Y_{it} = \beta_0 + \beta_1 X1_{,it} + \beta_2 X2_{,it} + \ldots + \beta_6 X_{nit} + \varepsilon_{it} \quad (1)$$

The model will be explained in more detail directly in the research results. The coefficients are estimated using the ordinary least squares (OLS) method. The essence of OLS is to find estimates that minimize the sum of squared deviations (residuals) of the model (2):

$$\min \sum_{i,t} (Yit - \beta 0 - \sum_{j=1}^{n} \beta j X jit) 2 \quad (2)$$

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OLS seeks the best approximation of the model to the empirical data, reducing the influence of random deviations.

RESULTS

The industry of Ukraine is a complex and at the same time critically important sector of the national economy. In the context of our study, we are most interested in their human capital, which is the basis of intellectual capital. During 2019–2023, the industry of Ukraine has observed steady negative dynamics in terms of the number of employees. The average cost per employee has increased, which can be explained both by inflationary pressure and by the attempt of enterprises to retain highly qualified personnel by increasing wages. However, at the same time, in conditions of martial law, such a trend as shown in Figure 1 may even be consistent with the very concept of intellectual capital: even with a reduction in personnel, enterprises try to maintain their quality by investing in the most valuable specialists.

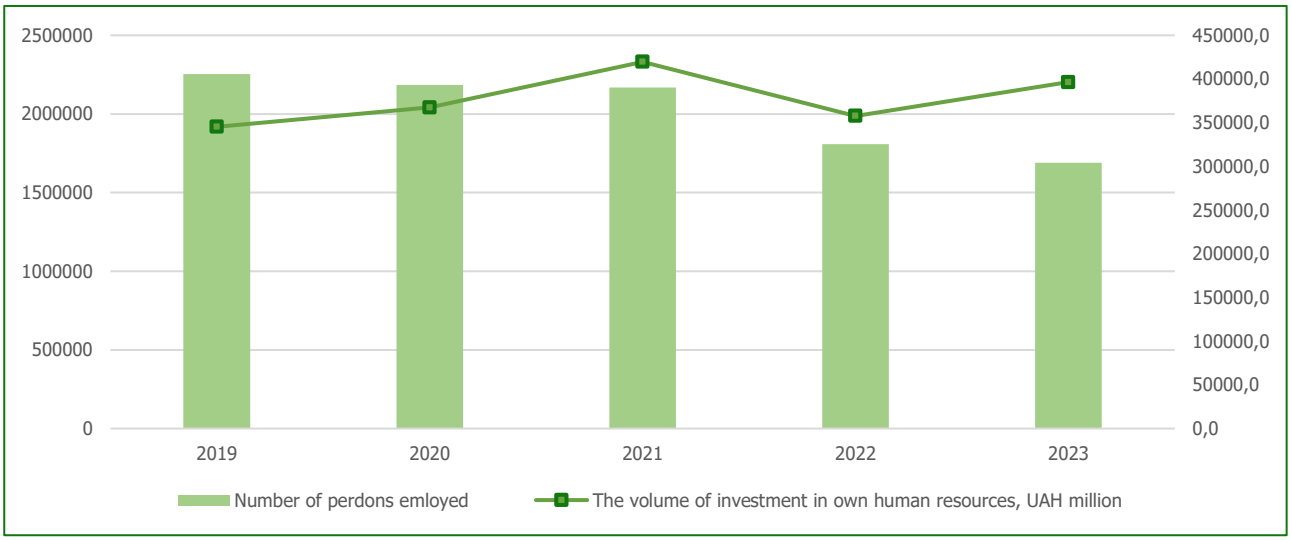

Figure 1. Changes in the number of employees at Ukrainian industrial enterprises and investments in them.

A significant part of enterprises found themselves in a war zone or under temporary occupation, some relocated or stopped production. In addition, there was a mass displacement of the population, which led to a reduction in labour resources. At the same time, despite these challenges, the industry was able to partially adapt, in particular by reducing the load on production facilities, automation, changing logistics and increasing wages for those employees who remained. Therefore, the search for financial instruments and their further use to preserve the intellectual capital that remained in Ukraine remains relevant.

For a modern industrial enterprise, intellectual capital is a key intangible resource. The structure of intellectual capital includes such fundamental elements as knowledge, experience, personnel skills (human capital), and the enterprise's ability to effectively manage and innovate (organizational and structural capital). No less important elements are communication links and reputation in the market (market capital). The decision-making process for the development and provision of intellectual capital (such as, for example, investing in R&D, improving personnel skills, and integrating innovative technologies) directly depends on the amount of financial resources. Industrial enterprises in Ukraine often have a limited amount of financial resources. Given this, the availability of effective financial instruments for attracting capital plays a key role in how much money will be used to develop intellectual capital.

To begin with, let's describe and detail the very structure of the intellectual capital of a modern industrial enterprise. It is common knowledge that modern intellectual capital management forms a strategy for its effective use for the enterprise. Intellectual capital includes knowledge, skills, experience, and qualifications, which, in turn, are implemented in labour productivity and increase the competitiveness of the enterprise in the market. However, in the context of our study, some aspects should be specified in the structure more clearly. Especially the factors that influence and determine this structure (Figure 2).

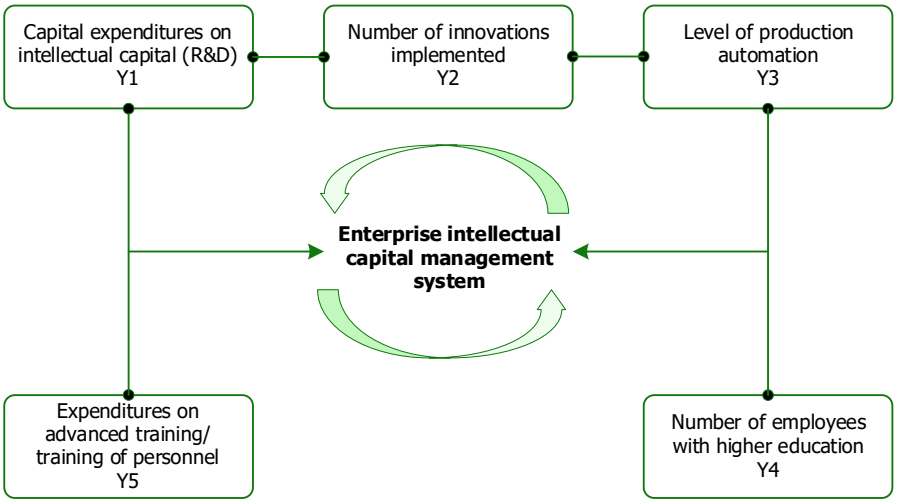

Figure 2. Factors influencing the intellectual capital management system of an enterprise.

Financial instruments, in our opinion, are critically important for the development of an enterprise's intellectual capital. It is thanks to them that companies can attract resources to invest in R&D, ensure staff training, implement innovative technologies, and support research initiatives. Therefore, we believe that it is financial instruments that provide the necessary resources for the growth of knowledge and competencies in an enterprise, directly affecting the increase in its competitiveness and economic potential (Figure 3).

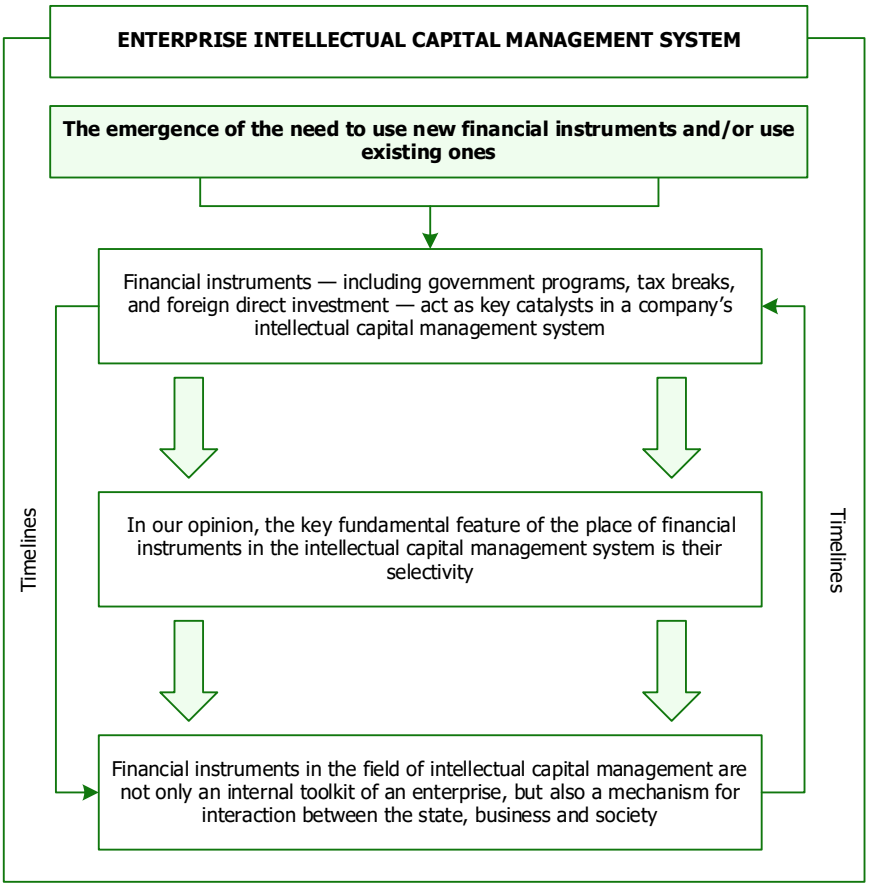

Figure 3. The place of financial instruments in the intellectual capital management system of an enterprise.

Next, we will proceed to a direct analysis based on data from five operating industrial enterprises in Ukraine over the last 5 years of their activity. So, we selected 5 industrial enterprises and collected their data for the last 5 years (2019–2023), so the total sample is 25 observations (Enterprise i × Year t). The goal is to investigate the impact of several financial

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instruments (bank loans, leasing, foreign direct investment, state support programs, tax breaks) and additional financial and economic factors (profitability, equity, sales volume, etc.) on various intellectual capital indicators (R&D expenses, innovation, automation, personnel, etc.) and see how they correlate. The indicators for intellectual capital itself are already shown in Figure 2, so let's now move on to the independent variables, which are divided into two groups:

Group A. Financial instruments:

- X1. Bank lending (volume of loans received per year),
- X2. Financial leasing (volume of leasing financing),
- X3. Foreign direct investment
- X4. State support programs (attracted funds, grants),
- X5. Tax benefits (notional amount of saved taxes),
- Group B. Additional financial and economic variables (control or accompanying factors):
- X6. Return on sales (ROSA)
- X7. Autonomy ratio (share of equity in the balance sheet),
- X8. Net sales volume (Table 1).

Table 1. Data X1-X8 for 2019-2023 for selected enterprises, UAH million.

Enterprise	Year	X1	X2	X3	X4	X5	X6 %	X7
1	2019	62.4	24.3	0.0	9.1	18.7	6.7	0.39
	2020	85.6	34.8	0.0	13.4	51.5	7.8	0.46
	2021	113.9	48.2	0.0	11.7	98.3	7.1	0.30
	2022	67.5	24.0	0.0	9.2	16.4	9.1	0.40
	2023	84.1	30.5	0.0	13.8	96.2	8.4	0.26
2	2019	95.2	43.6	15.3	52.1	11.4	6.9	0.42
	2020	106.8	55.1	13.0	43.4	1.0	5.1	0.36
	2021	120.3	68.9	10.4	62.5	10.7	9.6	0.34
	2022	77.4	41.2	5.7	28.9	12.6	8.8	0.45
	2023	89.7	69.3	6.2	24.1	5.3	4.9	0.20
3	2019	137.8	69.4	42.2	45.5	28.6	9.0	0.43
	2020	146.3	73.1	33.5	62.7	68.9	8.9	0.50
	2021	158.5	95.8	30.1	77.3	35.4	7.4	0.24
	2022	101.9	48.7	19.2	27.8	16.3	6.5	0.46
	2023	118.5	63.9	24.6	38.5	81.1	7.5	0.55
4	2019	153.2	73.5	13.8	11.4	10.9	5.0	0.26
	2020	176.7	83.6	16.1	12.7	28.5	8.7	0.23
	2021	185.5	95.4	21.4	13.5	69.6	8.0	0.38
	2022	113.1	49.2	11.6	4.8	5.7	6.8	0.44
	2023	116.4	61.8	14.3	4.2	27.9	9.6	0.54
5	2019	125.7	43.2	31.7	45.2	5.3	7.9	0.58
	2020	140.8	53.6	42.5	38.6	13.2	6.3	0.53
	2021	143.4	49.7	43.1	43.8	49.5	5.1	0.26
	2022	114.9	26.4	23.3	21.4	9.1	4.3	0.21
	2023	142.3	37.8	18.9	25.5	8.7	6.6	0.40

In total, we have 10 independent variables. Of course, in each specific model, not all of them can be included at once, otherwise, with 25 observations, there will be a risk of multicollinearity and "overloading" of the model. However, it is precisely such an expanded set that allows us to explore different variants of the equations.

Next, we note that the first step is to conduct a pairwise correlation analysis (Pearson coefficient) between the variables. So, Table 2 shows a generalized view of all key variables, based on the data of the selected 5 industrial enterprises based on the opinion of their management (Table 2).

Table 2. Matrix of pairwise correlations between key variables.

	Y1	Y2	Y3	Y4	Y5	X1	X2	X3	X4	X5	X6	X7	X8
Y1	1	0.63	0.5	0.55	0.6	0.32	0.1	0.6	0.72	0.8	0.35	0.3	0.4
Y2	0.63	1	0.7	0.58	0.65	0.3	0.02	0.58	0.55	0.62	0.45	0.35	0.45
Y3	0.5	0.7	1	0.48	0.42	0.15	0.75	0.4	0.3	0.35	0.3	0.2	0.25
Y4	0.55	0.58	0.48	1	0.55	0.28	0.1	0.62	0.4	0.5	0.33	0.4	0.38
Y5	0.6	0.65	0.42	0.55	1	0.22	0.05	0.55	0.6	0.65	0.4	0.35	0.35
X1	0.32	0.3	0.15	0.28	0.22	1	0.35	0.28	0.1	0.12	0.4	0.45	0.6
X2	0.1	0.02	0.75	0.1	0.05	0.35	1	0.25	0.05	0.07	0.2	0.3	0.3
X3	0.6	0.58	0.4	0.62	0.55	0.28	0.25	1	0.22	0.15	0.38	0.4	0.65
X4	0.72	0.55	0.3	0.4	0.6	0.1	0.05	0.22	1	0.68	0.3	0.25	0.2
X5	0.8	0.62	0.35	0.5	0.65	0.12	0.07	0.15	0.68	1	0.42	0.38	0.25
X6	0.35	0.45	0.3	0.33	0.4	0.4	0.2	0.38	0.3	0.42	1	0.45	0.5
X7	0.3	0.35	0.2	0.4	0.35	0.45	0.3	0.4	0.25	0.38	0.45	1	0.35
X8	0.4	0.45	0.25	0.38	0.35	0.6	0.3	0.65	0.2	0.25	0.5	0.35	1

To explain the data in Table 2, we note that, for example, all values starting from 0.50 and above indicate a significant positive relationship. For example, X2 (leasing) is quite highly correlated with automation (Y3 = 0.75), which supports the idea that leasing allows for frequent equipment renewal.

For each component of the intellectual capital management system "Y", we build five corresponding models:

- **Model 1** (dependent variable Y1, i.e., R&D expenses):

$$Y1_{,it}=\beta_0+\beta_1X1_{,it}+\beta_2X2_{,it}+\beta_3X3_{,it}+\beta_4X4_{,it}+\beta_5X5_{,it}+\beta_6X8_{,it}+\varepsilon_{it}$$

- **Model 2** (dependent variable Y2, number of innovations):

$$Y2_{,it}=a_0+a_1X1_{,it}+a_2X2_{,it}+a_3X3_{,it}+a_4X4_{,it}+a_5X5_{,it}+a_6X8_{,it}+\eta_{it}$$

- **Model 3** (dependent variable Y3, percentage of automation):

$$Y3_{,it}=\gamma_0+\gamma_1X1_{,it}+\gamma_2X2_{,it}+\gamma_3X3_{,it}+\gamma_4X4_{,it}+\gamma_5X5_{,it}+\gamma_6X8_{,it}+\nu_{it}$$

- **Model 4** (dependent variable Y4, number of employees with higher education):

$$Y4_{,it}=\delta_0+\delta_1X1_{,it}+\delta_2X2_{,it}+\delta_3X3_{,it}+\delta_4X4_{,it}+\delta_5X5_{,it}+\delta_6X8_{,it}+\mu_{it}$$

- **Model 5** (dependent variable Y5, personnel training expenses):

$$Y5_{,it}=\theta_0+\theta_1X1_{,it}+\theta_2X2_{,it}+\theta_3X3_{,it}+\theta_4X4_{,it}+\theta_5X5_{,it}+\theta_6X8_{,it}+\mu_{it}$$

Y is the dependent variable for enterprises; X is the independent variable; β, a, γ, δ, θ are free constants.

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After evaluating these models (for example, by the OLS method), we will obtain a table with the results, which will contain the following indicators (Table 3):

- Standard errors (Std. Error);
- t-statistics, p-value (p<0.05 indicates statistical significance at the 5% level (indicated in the table by double asterisks **). If p<0.1, we consider it marginally significant (one asterisk));
- coefficients of determination R^2, adjusted R^2adj (adjusted coefficient of determination, which takes into account the number of variables and sample size);
- F-test, check of the significance of the regression as a whole, etc.

Table 3. Results of regression analysis of the impact of financial instruments and financial and economic factors on intellectual capital indicators.

Indicator	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	2.10 (1.05) p=0.056	1.20 (0.60) p=0.068	40.0 (5.5) p=0.003*	50.0 (20.0) p=0.022*	0.40 (0.20) p=0.061
X1	0.15 (0.10) p=0.120	–	–	2.0 (1.0) p=0.095	–
X2	0.03 (0.02) p=0.230	–	0.60 (0.15) p=0.002*	–	–
X3	0.25 (0.07) p=0.004*	0.40 (0.12) p=0.006*	0.25 (0.10) p=0.058	3.0 (1.1) p=0.013*	–
X4	0.90 (0.30) p=0.008*	0.30 (0.16) p=0.080	–	–	0.55 (0.21) p=0.018*
X5	0.65 (0.20) p=0.010*	0.28 (0.09) p=0.005*	–	–	0.40 (0.15) p=0.013*
X6	–	0.10 (0.04) p=0.021*	–	3.5 (1.3) p=0.016*	0.12 (0.03) p=0.004*
X7	–	–	0.20 (0.09) p=0.055	–	–
X8	0.10 (0.05) p=0.070	0.05 (0.02) p=0.051	0.20 (0.07) p=0.014*	2.5 (1.0) p=0.028**	0.08 (0.03) p=0.040**
R^2	0.59	0.52	0.65	0.47	0.58
R^2adj	0.52	0.45	0.59	0.40	0.51
F-test, p-value	5.20 (p=0.002)**	4.10 (p=0.006)**	6.30 (p=0.001)**	3.90 (p=0.010)**	5.10 (p=0.003)**
Notes	**N=25**, OLS	**N=25**, OLS	**N=25**, OLS	**N=25**, OLS	**N=25**, OLS

It is important to explain the last line in detail. So, "N=25, OLS" means that the model was estimated on a sample of 25 observations (5 enterprises over 5 years) using the least squares method.

Let us present the interpretation for each model separately:

- **Model 1**. X3, X4 and X5 are all significant at the 5% level (p<0.01). The coefficient values of 0.25, 0.90 and 0.65 indicate that an increase in the level of financing through these channels will have a direct impact on R&D. Thus, for every UAH 1 million of attracted resources, the enterprise will, on average (depending on the source), increase research costs by 25% to 90% of this amount. Bank loans (X1) have a coefficient of 0.15, but p=0.12 (does not pass the 5% barrier). Given this, we can determine that the impact of loans on R&D cannot be statistically proven. Enterprises decide to quickly direct loan funds to other items, such as working capital, production costs and others.
- **Model 2.** X3 and X5 are again noticeably positive (0.40 and 0.28) and significant, which is consistent with the idea: foreign investment and tax incentives lead to an increase in the number of new products/technologies. X6 profitability also affects (0.10), i.e., more profitable enterprises are more actively launching innovations.
- **Model 3.** Leasing (X2) is a key and statistically significant factor (0.60, p=0.002). Accordingly, companies that actively purchase equipment on lease in their activities achieve a higher level of computerization and mechanization. While the sales volume has a coefficient of 0.20 (p=0.014). This indicates that the size of the company depends on the level of automation, given that they have the appropriate resources and scale.
- **Model 4.** A noticeable effect of X3 (coefficient 3.0, p=0.013): the arrival of a foreign investor correlates with an increase in the number of specialists with higher education (perhaps the investor sets requirements for staff qualifications or helps attract personnel).

- **Model 5.** Government support (X4) 0.55 (p=0.018) and tax incentives (X5) 0.40 (p=0.013) have a positive and significant impact. According to the results obtained, we can assume that these programs and targeted incentives will have a direct stimulating and encouraging effect. Profitability (X6) and sales volume (X8) also have positive and significant coefficients. Therefore, the larger and more profitable the enterprise, the more opportunities it has to allocate resources for personnel development.

In conclusion, we would like to emphasize that intellectual capital is becoming an increasingly crucial factor for success in industry. Our analysis has quantitatively shown which financial instruments work best in Ukrainian realities.

In order to ensure the reproducibility of the results obtained and the transparency of the research logic, we consider it appropriate to describe in detail the entire sequence of actions carried out within the framework of the analysis. In the first stage, five industrial enterprises of Ukraine were selected that operated during 2019–2023. Therefore, annual data were collected for each enterprise on selected financial indicators and intellectual capital indicators. Next, a pairwise correlation matrix (using the Pearson coefficient) was constructed to assess the linear relationships between variables. Based on the results of the correlation analysis and economic feasibility, five multiple linear regression models were constructed. We further have that the least squares method (OLS) was used to evaluate the models, while the adequacy of the models was additionally checked. The residuals were also checked for autocorrelation and heteroscedasticity. The summarized results of the model estimation, including coefficients, standard errors, and significance levels, are presented in Table 3.

DISCUSSION

The findings form the need to identify differences and common points in comparison with the studies of other authors in this area. Thus, first of all, in the article by Kuznyetsova et al. (2022) the importance of financial inclusion for social development and ensuring the stability of the financial system was noted. Our study also draws attention to the role of available financial resources, but we focused on target instruments (government programs, benefits) that have a direct impact on the development of intellectual capital. While Kuznyetsova et al. (2022) in their work focus more on the stability of financial institutions at the macro level.

Lenihan et al. (2019) analyze the impact of public policy on human capital and innovation. Our study agrees with this approach since it is a public investment that will have a positive impact on R&D spending. However, unlike the theoretical conclusions made by the authors (on determining the importance of increasing general government spending), we clearly identified specific financial instruments that will directly stimulate intellectual capital. No less interesting is the study by Libanova (2019), which examines the issue of labour migration and its impact on economic development. Although the focus of our study is somewhat different, the results of our study are consistent with and somewhat expand on the findings of Libanova (2019). Therefore, sufficient support for innovation and expanding opportunities for professional growth will reduce the outflow of personnel abroad.

CONCLUSIONS

The conducted correlation and regression analysis made it possible to establish that financial instruments today play a fundamental role in the process of stimulating the intellectual capital of enterprises in the industrial sector of Ukraine. In particular, it was determined that the decisive role (having the greatest direct impact) is played by state support programs and tax incentives. In addition, foreign direct investment has a significant impact on the number of implemented innovations and an increase in the number of qualified personnel. This confirms the thesis that the use of foreign capital often leads not only to an increase in the amount of financial resources but also stimulates technological and managerial development. At the same time, bank loans have demonstrated more indirect effects. Thus, the latter tends to increase the overall financial potential of the enterprise, but at the same time, the lack of target mechanisms can lead to the impossibility of transforming investments into intellectual capital. The study showed that leasing increases the level of automation of production several times, while the level of costs for research or educational activities will remain unchanged. Thus, the combination of government influence (through programs and benefits), strategic investments and the use of the enterprise's own credit capabilities form a complex "architecture" for attracting resources to stimulate innovative development.

Summarizing, the results confirmed the key hypothesis that it is the target orientation of finances (government grants, benefits, and partly foreign investments) that act as the strongest incentive for the growth of the intellectual component. The structural role of bank loans and leasing is to provide the enterprise with basic liquidity and enable the latter to restore its own collateral. But at the same time, without special preferential and grant conditions, significant amounts can be spent on production and operational activities, while ignoring research areas.

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As for practical recommendations, the latter boils down to the fact that enterprises should resort to actively attracting government financing programs, using tax incentives and conducting direct negotiations with foreign partners. At the same time, it is important to strengthen flexible support mechanisms at the state level (the main ones are tax credits for innovation, and joint public-private financing of R&D). The relevance of strengthening these mechanisms is due to their multiplier effect and ability to help enterprises invest in human capital. In general, the integration of various forms of financing, as well as a clear focus on innovation, will form the dominant factor in the modernization of industry and successful functioning in the conditions of global markets.

Further research is needed, including more companies and a longer period, and considering nonlinear and lag effects (e.g., the impact of financing on intellectual capital with a delay of several years). However, the results already obtained can serve as a basis for making informed management decisions and shaping innovation financing policies.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All Authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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МІСЦЕ ФІНАНСОВИХ ІНСТРУМЕНТІВ У СИСТЕМІ УПРАВЛІННЯ ІНТЕЛЕКТУАЛЬНИМ КАПІТАЛОМ ПІДПРИЄМСТВА

У статті розглянуті місце та роль фінансових інструментів у системі управління інтелектуальним капіталом на сучасному промисловому підприємстві в умовах трансформаційної економіки України. За мету взято спробу оцінити вплив фінансових інструментів на систему ухвалення управлінських рішень щодо розвитку інтелектуального капіталу на прикладі сучасних промислових підприємств України, а також виявити найбільш ефективні з них у контексті підтримки знаннєвої складової економіки. На основі теоретичних засад і аналізу емпіричних даних проведено повноцінне багатофакторне кореляційно-регресійне дослідження. У рамках дослідження було сформовано систему залежних змінних, що репрезентують ключові аспекти інтелектуального капіталу підприємства: витрати на R&D, кількість упроваджених інновацій, рівень автоматизації, кількість працівників із вищою освітою та інвестиції в навчання персоналу. Результати аналізу засвідчили, що найбільший позитивний вплив на інтелектуальний капітал чинять податкові пільги, державна підтримка та прямі іноземні інвестиції. Натомість банківське кредитування та лізинг мають менш виражений або непрямий ефект.

Ключові слова: інтелектуальний капітал, фінансові інструменти, промислове підприємство, управління знаннями, багатофакторна регресія, R&D, державна підтримка, податкові пільги, інвестиції, кадровий потенціал

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