DOI: 10.55643/fcaptp.5.64.2025.4859

HR INNOVATIONS, HUMAN CAPITAL AND FINANCIAL STABILITY: INTERRELATIONSHIPS AND INTERACTION ON THE EXAMPLE OF INTERNATIONAL COMPANIES

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Received: 05/06/2025
Accepted: 03/10/2025
Published: 31/10/2025

ABSTRACT

The article provides a comprehensive analysis of the effectiveness of implementing the latest HR technologies in enterprises in the context of the relationship between the level of innovation, human capital development, and financial stability of companies. The aim of the study is to empirically substantiate the statistically significant impact of HR innovations on employee recruitment and development, financial performance, and to assess the reverse impact of human capital on a company's innovation potential.

Within the framework of the study, three hypotheses were formulated regarding the existence of a direct and reverse impact between key variables. The hypotheses were tested by constructing three separate linear regression models using the ordinary least squares (OLS) method. The statistical database includes panel data for 2017–2024 on 20 leading international companies operating in Ukraine, Poland, Latvia, and Bulgaria, among other countries. The data source is the publicly available annual reports of the Drucker Institute (Claremont Graduate University, USA), which ensures high reliability and comparability of data.

Based on an analysis of companies' positions in a multidimensional performance ranking (which includes five key components: customer satisfaction, staff development, innovation, social responsibility, and financial stability), it was found that companies that are leaders in innovation (Microsoft, Amazon, Johnson & Johnson) also demonstrate high results in terms of personnel and financial management performance. These companies actively implement modern HR technologies, including recruitment automation tools, training and development platforms, and data-based personnel performance evaluation systems (HR analytics), which contribute to increased productivity, adaptability, and competitiveness.

To assess the strength and significance of the impact, R^2 determination coefficients, β coefficients, and p-values were used. The results of the regression analysis showed a strong and statistically significant positive impact of the level of innovation on human capital development (model 1) and the financial stability of the company (model 2). In turn, Model 3 confirms the reverse positive impact of employee engagement and development on the innovativeness of enterprises, confirming the existence of a two-way relationship between human capital and innovation.

Keywords: human capital, human capital management (HCM), cutting-edge technologies, human resource management (HRM), HR technologies, financial stability, digital technologies, artificial intelligence, big data, cloud technologies

JEL Classification: J24, M12, O33

INTRODUCTION

One of the most important structural elements of the business environment of a modern enterprise at any stage of its operation is an effective system for managing personnel and their activities. The level of productivity and quality of work, as well as employee interest in the work process, depend on the effectiveness of the personnel management system and the competent use of the latest technologies. At the same time, with the

help of the right direction in the use of the latest HR technologies and personnel management methods, the company has the opportunity to ensure the transition to the next stage of the life cycle through the improvement of activities and the strengthening of competitive positions, and thus ensure financial stability.

The hyperactive development of the digital economy has led to the formation of a completely new model of human-machine interaction based on the active use of the latest technologies in virtually all areas of human activity. Most of the information systems used by enterprises in their work are integrated with big data analytics, enterprise analytical data is transferred to the cloud, artificial intelligence and chatbots are actively used, which requires staff to master new specific skills and higher qualifications; job responsibilities are changing in line with industry and corporate needs; requirements for employee personal characteristics are also increasing, creating an urgent need to attract and retain talent and develop company personnel for successful financial and economic activity.

LITERATURE REVIEW

Many scientific studies have been devoted to the relationship between human capital development, the introduction of new technologies, and the financial performance of companies. These studies cover both theoretical aspects of effective management of socio-economic and innovation potential and empirical assessments of the impact of digitalisation and innovation on the productivity and sustainability of enterprises (Lehmann & Beckmann, 2024; Tessema, Yang, & Chen, 2025; Kale & Anute, 2022).

In particular, the article by Bhuwaneswari R., Udagi K., and Hugg M. explores the transformation of human capital management in the digital age, focusing on trends, challenges, and strategic implications for organisations. The researchers argue that the field of human resource management (HRM) is undergoing transformational changes as organisations implement digital technologies to improve decision-making and employee engagement. The results of the analysis conducted in the study show that the successful implementation of digital HRM depends on organisational readiness, technological infrastructure, and continuous innovation (Bhuwaneshwari, Udagi, & Huggi, 2023).

The study by Aydin, O., Karaarslan, E., and Narin, N.G. examines the integration of artificial intelligence, virtual reality (VR), augmented reality (AR), and metaverse technologies into human capital management. The researchers analyse how these technologies are transforming traditional HR practices, including recruiting, selection, onboarding, training, and performance management. The study highlights the potential of these technologies to create more efficient, inclusive, and innovative work environments (Aydin, Karaarslan, & Narin, 2024).

Pusita, R. A. S., analyses the transformative impact of digital technologies on human capital management practices in modern organisations. The researcher argues that as companies accelerate their digital transformation, the HR function is also evolving, implementing innovative technological solutions to optimise processes, improve employee experience, and increase strategic value. Based on an analysis of existing literature and industry practices, the paper offers strategic recommendations for the effective implementation of digital technologies in HR to achieve competitive advantages and create value. The results emphasise the importance of a balanced approach that combines technological innovation with people-centric HR practices (Puspita, 2024).

Another researcher, Elbadavi M. A., studies the impact of artificial intelligence on employee engagement and productivity in HRM. He argues that the integration of artificial intelligence into all areas of activity demonstrates the potential to improve HR operations by increasing engagement and efficiency through instant, personalised interactions. This study examines the advantages and limitations of using artificial intelligence in HRM, highlighting how this type of cutting-edge technology can increase employee satisfaction and productivity while addressing ethical issues and data quality concerns (Elbadawi, 2024).

Parvati R. and Inampudi P. take an in-depth look at the latest trends in human resource management (HRM), highlighting technological advances, employee well-being, flexible practices, and the implications of remote work. The researchers examine the goals, consequences, and future prospects of these trends, highlighting how they are changing organisational practices and necessitating the development of new adaptive HRM strategies to enhance the dynamics of human capital development. The introduction of artificial intelligence, machine learning, and big data analytics is transforming recruitment, performance management, and employee development, so researchers emphasise the strategic use of HR analytics for data-driven decision-making (Parvathi & Inampudi, 2024).

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Srivastava S.'s research provides a comprehensive overview of how artificial intelligence improves recruitment efficiency, enhances decision-making, and addresses issues related to fairness and bias. Key theoretical foundations, including decision-making theory, are used by researchers to analyse the role of artificial intelligence and its significance in hiring processes. (Srivastava, S. (2024).

Researchers Indradevi R., Saty N., and Baskar B. argue that identifying strategic ways to effectively organise and manage people is essential to achieving maximum profitability and efficiency. At the same time, new technologies are the driving force behind business in the modern world, so human capital management strategies must take this into account. The researchers focus on various ethical and practical issues that arise in the field of human resource management, as well as elements that contribute to the effective integration of technology into the HRM system. The results of their research show how technological solutions are implemented in strategic HRM, and this has a significant impact on the effectiveness of these solutions. Based on this, they conclude that companies should always invest in technology and adapt to changes in the SHRM industry (Indradevi, Sathya, & Baskar, 2024).

Despite growing interest in the impact of new technologies on human capital development and financial stability of enterprises, there are a number of key aspects that remain understudied.

First, existing empirical studies evaluating the effectiveness of innovative technologies and their impact on employee development and company financial performance tend to be fragmented in their approach and focus on individual elements of key components (e.g., the impact of artificial intelligence on other key components or the measurement of effectiveness only in the context of its relationship to labour productivity). In other words, a comprehensive scientific approach to studying the relationship between human capital, new technologies, and financial results has not yet been developed.

Secondly, scientific research has largely failed to develop clear models and mechanisms that reflect the impact of HR innovations on staff recruitment and development, as well as on the financial performance of enterprises. This complicates the empirical testing of hypotheses regarding the direct and indirect impact of innovations on human capital and key performance indicators.

The unresolved issues we have identified, which are related to the comprehensive analysis of the effectiveness of digital HR technologies and their impact on employee development and company financial results, determine the relevance of further empirical research in this area.

AIMS AND OBJECTIVES

The purpose of the article is to conduct a comprehensive analysis of the effectiveness of using the latest HR technologies in enterprises, taking into account the interrelationships between the level of innovation, human capital development and financial stability of companies. In particular, the study aims to empirically test hypotheses regarding the statistically significant impact of innovation on employee recruitment and development and financial performance, as well as the interdependence between employee development and companies' ability to innovate.

METHODS

To achieve the set goal, the following research methods were used: comparative analysis – to identify trends in the development of innovative technologies in the HR sphere of international companies analysed in the study; content analysis method – for an in-depth study of individual types of modern HR technologies and areas of their application to improve the efficiency of international companies; linear regression method – to determine the statistical significance of the relationship and impact of innovation and human capital on the performance of international companies; dialectical method and methods of theoretical generalisation – to form research conclusions; graphical methods – when presenting comprehensive research results.

RESULTS

To achieve the set goal, the following research hypotheses were formulated:

1. H_1 (hypothesis 1) – there is a statistically significant positive impact of the level of innovation on employee engagement and development.

2. H_2 (hypothesis 2) – there is a statistically significant positive impact of the level of innovation on the financial stability of the company.
3. H_3 (hypothesis 3) – there is a statistically significant positive impact of the level of employee engagement and development on innovation.

Construction of a regression model. To test the hypotheses, three separate linear regression models were constructed:

1. model 1 (Innovation → Employee Engagement and Development):

$$Y_i(1) = \beta_0(1) + \beta_1(1) \times \text{Innovation}_i + \varepsilon_i \quad (1)$$

2. model 2 (Innovation → Financial Strength):

$$Y_i(2) = \beta_0(2) + \beta_1(2) \times \text{Innovation}_i + \varepsilon_i \quad (2)$$

3. model 3 (Employee Engagement and Development → Innovation):

$$Y_i(3) = \beta_0(3) + \beta_1(3) \times \text{Employee Engagement}_i + \varepsilon_i \quad (3)$$

The study used panel data for 2017–2024 on 20 leading international companies in the fields of healthcare, IT, goods and services production, consulting, and financial activities, which have their official representative offices and operate (in particular) in Ukraine, Poland, Latvia, and Bulgaria (since the socio-economic processes of these countries are within the scope of the authors' research). The total number of observations was 160 for each variable. The data was obtained from the Drucker Institute's (Claremont University, California) open annual company ranking.

Regression analysis was performed using the least squares method (OLS). To assess the significance of the impact of the indicators, the following were used:

1. Coefficient of determination R^2 – measure of model quality.
2. Values of coefficients β_1 – strength of influence of the independent variable.
3. P-value – test of statistical significance of hypothesis H_0: $\beta_1 = 0$.

The level of statistical significance is set at $\alpha = 0.05$.

The criteria for assessing the impact are presented in Table 1 and are distributed as follows:

1. Strong and significant impact: $|\beta_1| > 0.4$; $p < 0.05$.
2. Weak but significant impact: $0.2 \leq |\beta_1| \leq 0.4$; $p < 0.05$.
3. Insignificant impact: $p \geq 0.05$.
4. Negative impact: $\beta_1 < 0$.

This means that the impact is considered confirmed only when two criteria are met simultaneously. That is, if the coefficient β_1 has the appropriate value, but $p \geq 0.05$, the effect is not confirmed because it is statistically insignificant. Similarly, even with a significant p-value but insufficient $|\beta_1|$, the effect is considered weak or absent.

Table 1. Criteria for assessing the degree of influence of indicators within the applied model. *(Sources: Elsayir, 2024)*

1. Strength of influence (by coefficient):	
0.0 – 0.2	Very weak connection
0.2 – 0.4	Weak connection
0.4 – 0.6	Moderate connection
0.6 – 0.8	Strong correlation
0.8 – 1.0	Very strong correlation
2. Significance of impact (by p-value):	
≤ 0.01	Very significant impact
≤ 0.05	Statistically significant impact
≤ 0.1	Weakly significant impact
> 0.1	The effect is statistically insignificant

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Our research covers 20 large international companies that occupy different positions in the overall corporate performance ranking and are officially represented in the markets of Ukraine, Poland, Latvia, and Bulgaria. The rating of the organisations studied using a five-dimensional approach to assessing company performance (customer satisfaction, employee engagement and development, innovation, social responsibility, and financial stability) is presented in Table 2.

Table 2. Ranking of the companies studied using a five-dimensional approach to assessing company performance and its initial measurements, 2024. *(Sources: based on the author's research and sources (Drucker Institute, 2025)*

Ran-king	Company	Customer Satisfaction	Employee Engagement and Development	Innovation	Social Responsibility	Financial Strength	Effectiveness
3	Microsoft Corp.	58.2	68.5	97.6	68.5	99.4	88.8
4	Intel Corp.	72.1	64.2	82.0	73.6	45.7	78.5
6	Johnson & Johnson	51.9	66.2	88.1	64.5	66.4	75.5
7	Procter & Gamble Co.	66.0	63.2	75.2	53.5	87.5	75.2
8	Alphabet Inc.	51.5	65.0	74.9	57.6	96.6	74.2
10	Philip Morris International Inc.	59.2	68.5	85.4	58.3	58.1	73.8
11	Visa Inc.	59.1	64.8	78.0	63.7	64.9	73.6
15	Cisco Systems Inc.	64.8	69.3	65.4	67.3	55.0	72.1
16	Oracle Corp.	66.4	55.1	77.1	63.4	60.9	71.9
17	PepsiCo Inc.	62.2	55.1	74.3	67.3	63.2	71.5
19	Amazon.com Inc.	56.2	49.1	90.8	47.3	90.6	71.3
20	International Business Machines Corp.	60.4	61.9	71.4	67.6	58.2	71.2
31	Accenture PLC	63.2	63.2	52.1	71.9	59.9	68.2
45	Pfizer Inc.	59.8	56.6	74.1	62.7	45.3	66.1
46	AbbVie Inc.	58.7	62.8	62.5	60.9	58.2	65.8
49	Ecolab Inc.	64.6	55.4	67.8	62.1	48.9	65.7
54	Coca-Cola Co.	67.1	58.2	57.4	59.4	60.3	65.4
72	Citigroup Inc.	49.7	55.6	72.2	62.8	52.6	63.4
82	CBRE Group Inc.	53.5	60.5	46.2	65.5	72.0	62.6
105	Johnson Controls International PLC	69.5	50.7	50.3	64.8	46.2	60.9

As has been repeatedly proven in many scientific studies, innovation is a critical factor in the successful long-term development of companies in an economically unstable and rapidly changing business environment. Thus, analysis of the data in Table 2 shows that such well-known giant companies as Microsoft (97.6), Amazon (90.8), and Johnson & Johnson (88.1), which are the undisputed leaders in many international ratings, received the highest scores for innovation (Figure 1). This indicates significant investments in research and development, new product development, and the introduction of the latest digital technologies and processes into production and labour relations, which undoubtedly ensure the flexibility and adaptability of the company and greater productivity of its personnel.

These conclusions are confirmed by proven theoretical models of innovation management, according to which companies with a high level of innovation usually occupy leading positions in the industry and are able to generate unique values and create a significant technological gap with their competitors (Steele & Watts, 2022).

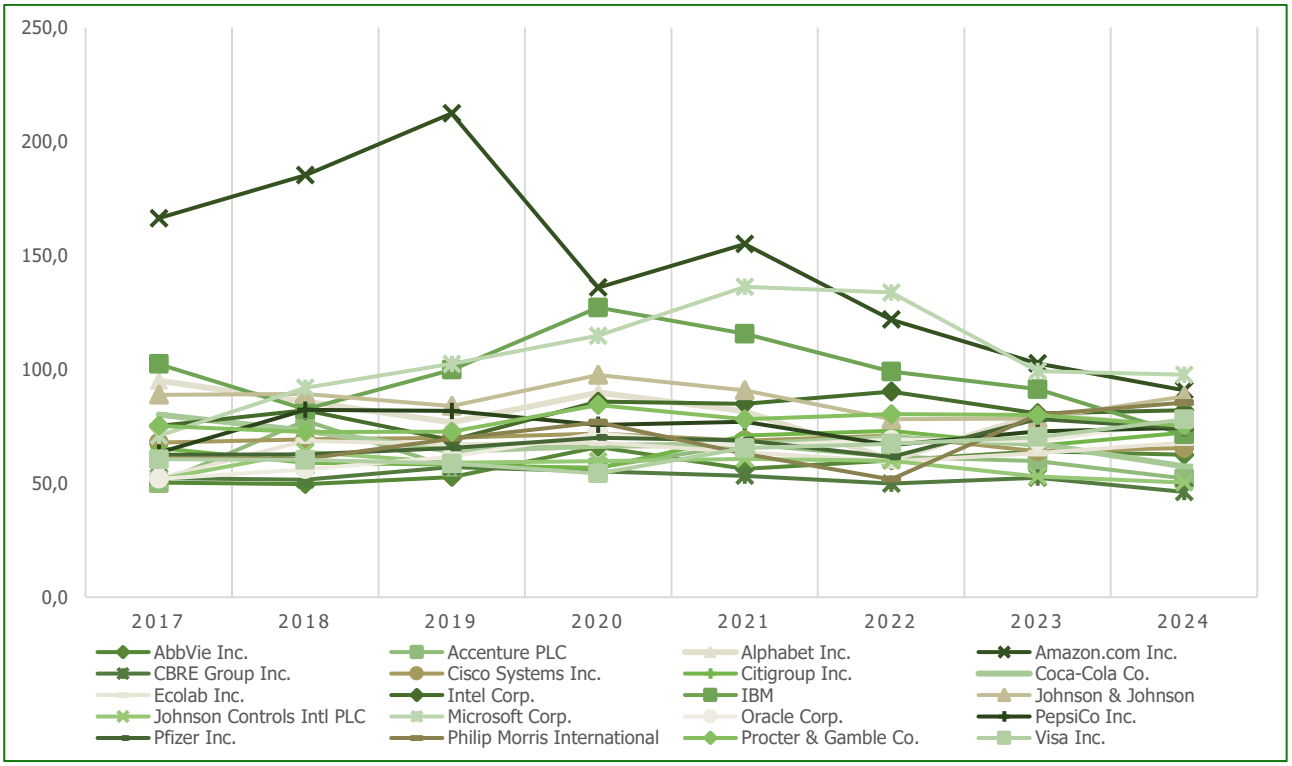

Figure 1. Comparative dynamics of the level of development and implementation of innovative technologies in 20 international companies studied. *(Sources: based on the author's research and sources (Drucker Institute, 2025)*

The main areas of implementation of the latest human resource management technologies in the activities of some of the international companies analysed are presented in Table 3.

Table 3. Main areas of implementation of new HR technologies in the activities of leading global companies.

No.	Company Name	Types of Technological Innovations
1	PepsiCo Inc.	Digital HR transformation: AI, mobile apps, strategic workforce planning
2	Microsoft	AI-based HR analytics
3	Pfizer Inc.	AI in recruitment, digital platforms for employee support, innovation culture
4	Cisco Systems Inc.	Internal CRM – proprietary human resources management technology
5	Coca-Cola	AI and mobile app for HR management (Leena AI)
6	Philip Morris International Inc.	HR transformation to support a smoke-free future strategy, culture of growth and innovation
7	Procter & Gamble Co.	AI integration in teamwork, personalized learning, and leadership development
8	Visa Inc.	Large-scale AI implementation, learning and development culture, data infrastructure investments
9	AbbVie Inc.	Digital platforms for learning and development; employee well-being support programs (EAP)
10	Accenture PLC	AI and data analytics in HR; platforms for skills development and talent management
11	Alphabet Inc.	People Analytics; data-driven tools for HR decision-making
12	Amazon.com Inc.	Algorithmic personnel management; real-time performance tracking systems; A to Z mobile app for employees
13	CBRE Group Inc.	Interactive workplace technologies; workforce planning analytics; recruitment technologies; AI assistants (Ellis AI)
14	Citigroup Inc.	AI-based tools for employees (Citi Assist, Citi Stylus); cloud HR technologies (Google Cloud Vertex AI)
15	Ecolab Inc.	Cloud platform for managing temporary workers (CTS), internal talent mobility
16	Intel Corp.	AI in HR, 'AI for Workforce' program, new performance management system
17	IBM	Blockchain for employee credentials, personalized AI-based learning
18	Johnson & Johnson	HR leadership development program (E-HRLDP), AI integration in HR processes
19	Johnson Controls International PLC	Integrated HR platforms, inclusion culture, continuous learning
20	Oracle Corp.	Oracle Cloud HCM, AI for HR, Activity Centers

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We conducted a detailed study of the directions and effects of implementing new HR technologies in the activities of these leading global companies. However, below we will describe only the most striking examples of this type of activity.

For example, PepsiCo is actively implementing digital tools to improve the employee experience. Artificial intelligence makes it possible to automate routine HR processes, reduce the workload on HR staff, and improve the accuracy of forecasting staffing needs. Mobile solutions provide flexibility and quick access to HR functions, which is especially important in a remote work environment. Strategic workforce planning helps companies better adapt to global market challenges and increase their competitiveness (SHRM, 2024).

AbbVie focuses on attracting and retaining talent through personalised development and wellness support. The Learn. Develop. The programme and the global Employee Assistance Programme (EAP) provide resources for professional growth and personal support. The implementation of flexible and hybrid working models (Where We Work) promotes a better work-life balance, increasing engagement and productivity (AbbVie, 2024).

Amazon uses complex algorithmic systems to manage large numbers of employees, especially in warehouses. Technologies include scanners to track productivity and the 'A to Z' mobile app for employee self-service (access to schedules, salaries, vacation requests). This is aimed at improving operational efficiency, although it raises questions about working conditions (The Register, 2025).

Ecolab has implemented Contingent Talent Solution (CTS), a cloud-based solution for managing the process from request to payment for temporary workers, which integrates with the human capital management system to improve workforce reporting. In addition, the company is actively developing internal talent mobility as an employee development tool (i4cp, 2025).

IBM uses blockchain to securely store employee credentials such as certificates and work experience, ensuring control over personal data. The company has developed the Your Learning platform, a personalised digital marketplace for learning that is visited by 98% of employees every quarter, with a learning chatbot that answers questions 24/7 (IBM, 2024).

Johnson & Johnson is implementing a two-year E-HRLDP programme to develop future HR leaders through rotation and mentoring. The company is also implementing AI to automate administrative tasks (Johnson & Johnson, 2025).

Oracle offers Oracle Cloud HCM, a comprehensive cloud-based human capital management solution that includes AI for task automation, analytics, and employee engagement. New Activity Centres provide personalised tools to improve employee productivity (Rouse, 2024).

In the context of considering the indicator 'employee engagement and development' as a key element of sustainable innovative development, we can emphasise that human capital development is the foundation for supporting the innovative activities of any company. Among the companies studied, all of those that best implement this component of effectiveness — Cisco (69.3), Microsoft (68.5), Philip Morris (68.5), Alphabet (65.0), and Intel (64.2) — have a systematic approach to personnel development.

Scientific research shows that high employee development indicators correlate positively with a company's ability to innovate. This is because highly skilled and motivated staff are more effective at transforming their ideas into commercial products or processes. This approach contributes to the formation of an innovative culture within the company and reduces the risk of losing unique advantages and highly competitive positions in the market.

At the same time, in today's environment, there are many opportunities to improve the efficiency of companies by introducing the latest HR technologies into work processes (Figure 2).

As for the interconnection of innovations, human capital, and financial sustainability, financial sustainability can be an indicator of the effectiveness of innovation and HR strategies. The leading positions in this indicator are occupied by Microsoft (99.4), Alphabet (96.6), Amazon (90.6), and Procter & Gamble (87.5). The high financial performance of the analysed companies demonstrates a fairly effective level of resource management and the ability of company management to transform the synergistic effect of using the latest technologies and human capital into profits and sustainable growth. This is confirmed by theories and concepts that emphasise that unique internal resources, such as the latest technologies and personnel, are an indisputable source of competitive advantage.

For example, Microsoft and Alphabet demonstrate high strategic coherence, combining top indicators of innovation, personnel development, and financial stability. This demonstrates an integrated approach to management, where innovations do not exist in isolation but are supported by systemic investments in human capital and a stable financial policy. This synergistic effect ensures long-term competitiveness and market leadership.

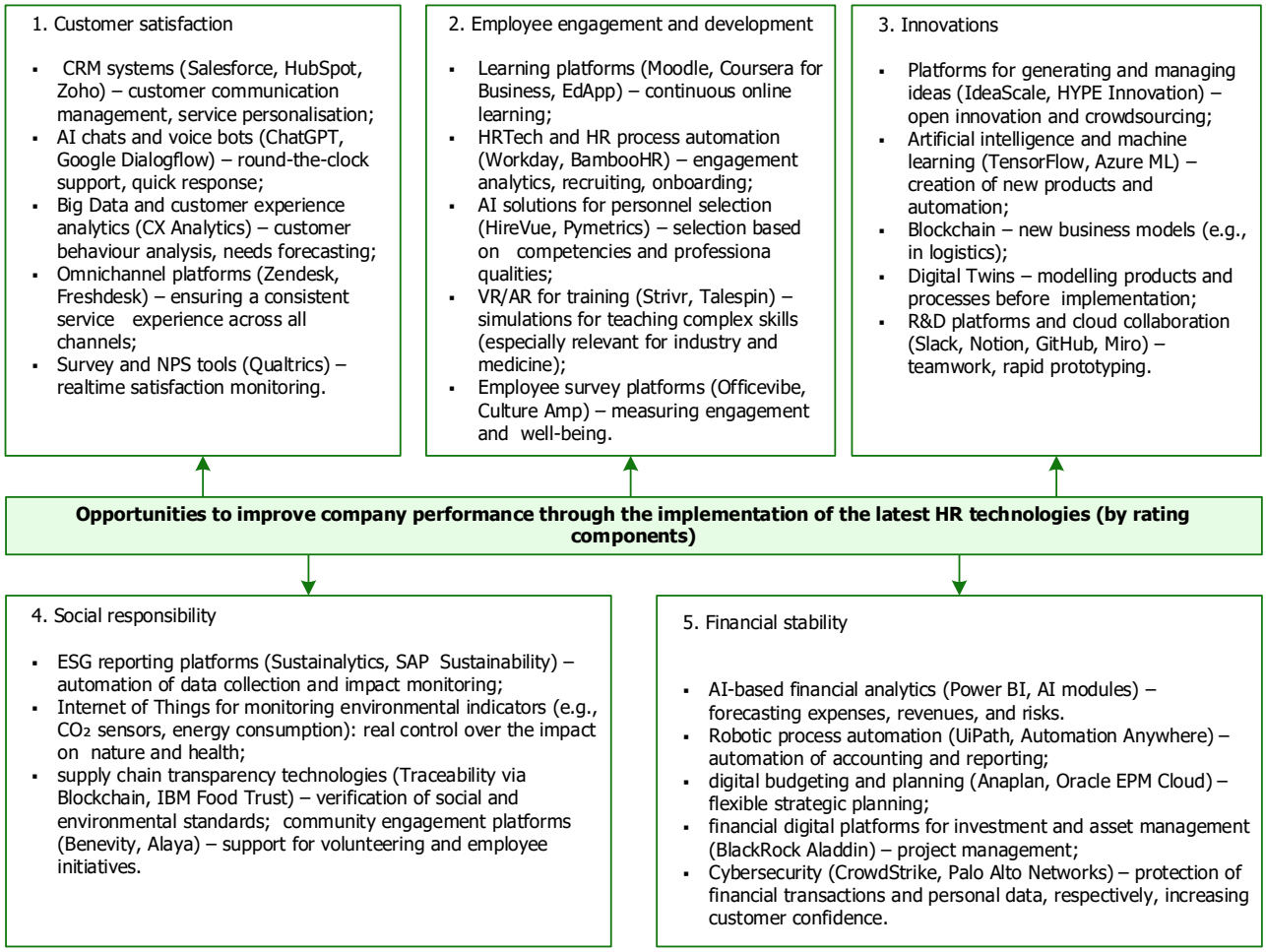

Figure 2. Opportunities to improve the efficiency of companies through the introduction of the latest HR technologies in labour processes (by rating components).

Amazon is characterised by very high innovation (90.8) and financial stability (90.6), but relatively low levels of employee development (49.1). This gap may reflect the company's focus on technological and engineering innovation, often supported by external or automated processes, with less emphasis on corporate culture and human capital development. In the long term, this may pose risks to talent retention and the company's flexibility to meet modern challenges.

Intel has a high innovation potential (82.0) and an average level of staff development (64.2), but relatively low financial stability (45.7), which indicates possible problems in transforming innovation potential into profitability (this may be due to intense competition, high operating costs, or changes in market conditions that affect financial results).

The results of the analysis indicate that effective human capital management is an important link between the introduction of new technologies and the financial performance of companies. In other words, without active measures aimed at improving the quality of human capital, in particular, stimulating the training and development of employees and their acquisition of new competencies, innovations may not always be transformed into financial effects and benefits. At the same time, achieving a certain level of financial sustainability makes it possible to make long-term investments that can be directed both to research and development of the latest technologies and to the development of human capital. Accordingly, in order to achieve a high level of development, companies need to develop sound integrated strategies for managing innovations, human resources, and financial resources. The practical significance of the above conclusions requires scientific substantiation and proof of hypotheses that can confirm our assumptions.

Based on the preliminary results of the study, which emphasise the importance of developing integrated strategies for managing innovation, human resources and finance to achieve sustainable competitive success, we formulate hypotheses in the form of regression models for quantitative analysis, which assume a statistically significant positive impact of innovation on employee engagement and development (hypothesis 1); a statistically significant positive impact of innovation on financial sustainability (hypothesis 2); a statistically significant positive impact of employee engagement and development on innovation (hypothesis 3). Let us present these hypotheses in the form of regression models:

DOI: 10.55643/fcaptp.5.64.2025.4859

- Innovation → Employee Engagement and Development (1);
- Innovation → Financial Strength (2);
- Employee Engagement and Development → Innovation (3).

We implemented these models using linear regression (OLS), and the quality of the models was checked using R^2 (coefficient of determination) and p-value (probability of first-kind error). R^2 and p-value together provide an estimate of the strength of the relationship (R^2) and its reliability (p-value), which is critical for confirming or rejecting the hypotheses in the study (Table 4).

Table 4. Components and interpretation of hypotheses in the context of regression analysis of the relationship and mutual influence of innovation, employee engagement, development, and financial sustainability.

Components of Hypotheses	Interpretation of R^2	Interpretation of p-value
Innovation → Finance	To what extent does innovation explain financial outcomes	Whether innovation has a statistically significant impact on finance
Innovation → Human Capital	To what extent is innovation related to employee development	Whether the relationship is random or statistically significant
Human Capital → Innovation	Whether employee development is associated with company innovativeness	How reliable is this effect from a statistical perspective

The results of the analysis based on the proposed regression model 1 (the impact of innovations on employee engagement and development) are presented in Table 5.

Table 5. Results of the analysis based on regression model 1 (impact of innovations on employee engagement and development).

No.	Company	β	R^2	P-value
I. Strong and meaningful				
1	Accenture PLC	0.446	0.940	0.002
2	Microsoft Corp.	0.371	0.850	0.008
3	Amazon.com Inc.	0.281	0.880	0.006
4	Cisco Systems Inc.	0.435	0.800	0.014
5	Intel Corp.	0.328	0.750	0.021
6	AbbVie Inc.	0.242	0.720	0.027
7	Coca-Cola Co.	0.255	0.710	0.030
8	Alphabet Inc.	0.231	0.710	0.030
9	IBM	0.289	0.610	0.050
10	Oracle Corp.	0.262	0.610	0.050
11	Johnson Controls International PLC	-0.236	0.520	0.043
II. Weak but significant				
12	Ecolab Inc.	0.155	0.490	0.090
III. Strong but insignificant				
13	Johnson & Johnson	0.213	0.540	0.070
14	CBRE Group Inc.	0.188	0.560	0.060
15	Pfizer Inc.	0.249	0.580	0.058
16	Visa Inc.	0.451	0.298	0.162
IV. Weak and insignificant				
17	Philip Morris	0.225	0.206	0.258
18	Procter & Gamble	0.168	0.420	0.110
19	Citigroup Inc.	0.079	0.370	0.150
20	PepsiCo Inc.	-0.047	0.026	0.701

The possibility of confirming the hypothesis is given by the results (strong and significant relationship) obtained for 11 out of 20 companies (55%), which have a strong positive and statistically significant relationship between innovation and human capital indicators. These companies are: Accenture, Microsoft, Amazon, Cisco, and Intel (technology-oriented companies that actively invest in innovation and staff development). Coca-Cola, Alphabet, IBM, Oracle, and AbbVie are companies from various sectors of the economy that also pay special attention to innovation in general, as well as to technological improvement of HR processes and enhancement of human capital management.

For the purpose of visual interpretation of the results of the proposed regression models, we plot the β coefficients with 95% confidence intervals for all our hypotheses (Figure 3).

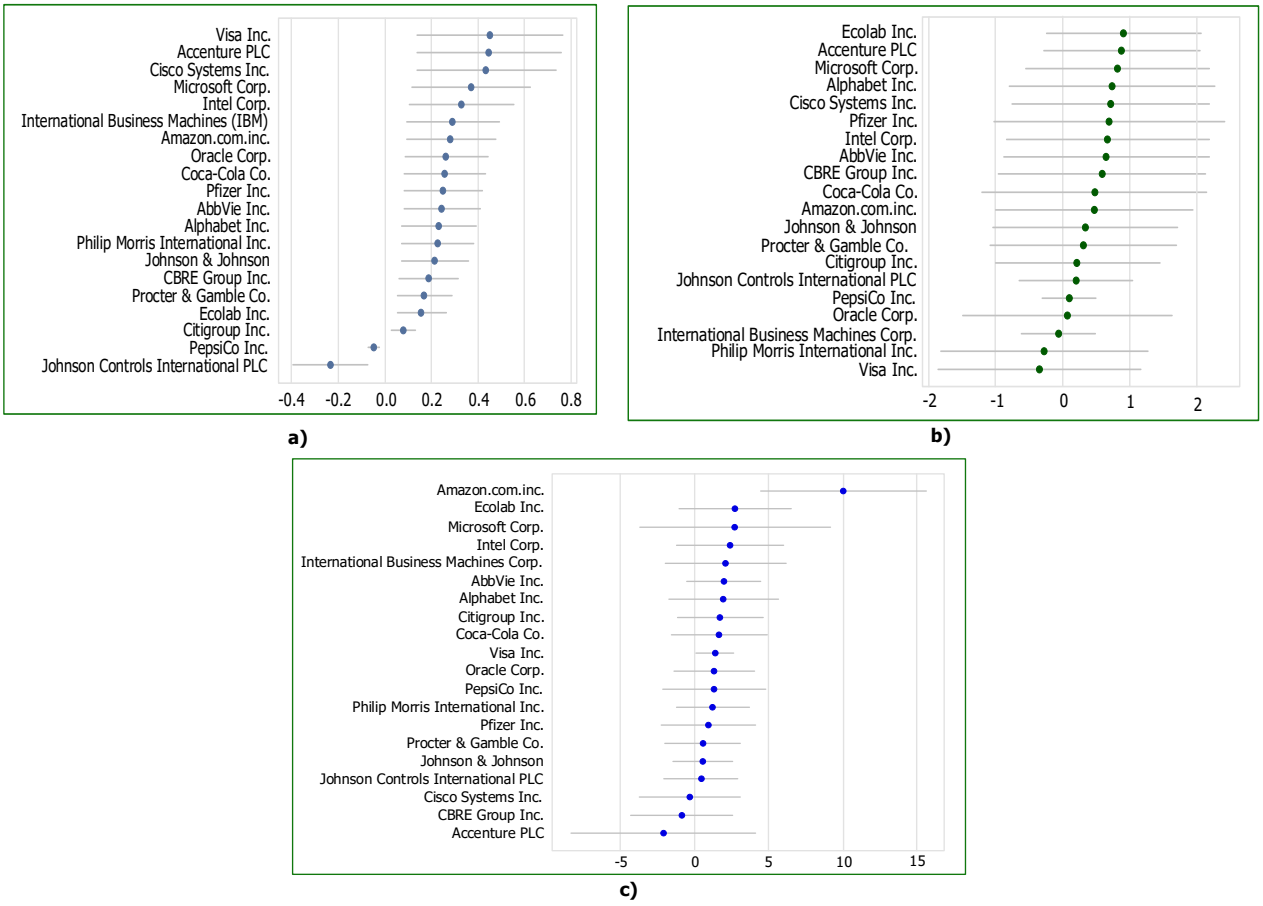

Figure 3. Graphs of the β coefficients with confidence intervals describing: a) the impact of innovation on employee engagement and development; b) the impact of innovation on the company's financial sustainability; c) the impact of employee engagement and development on innovation.

The results of the analysis based on regression model 2 (impact of innovations on the company's financial sustainability) are presented in Table 6.

Table 6. Results of the analysis based on regression model 2 (impact of innovations on the company's financial sustainability).

No.	Company	β	R^2	P-value
I. Strong and meaningful impact				
1	Ecolab Inc.	0.910	0.732	0.002
2	Accenture PLC	0.880	0.711	0.003
3	Microsoft Corp.	0.820	0.608	0.006
4	Alphabet Inc.	0.740	0.502	0.013
5	Cisco Systems	0.720	0.513	0.011
6	Pfizer Inc.	0.700	0.421	0.023
7	Intel Corp.	0.670	0.462	0.018

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DOI: 10.55643/fcaptp.5.64.2025.4859

Table 6. Continued.

No.	Company	β	R^2	P-value
8	AbbVie Inc.	0.650	0.442	0.021
9	CBRE Group Inc.	0.590	0.392	0.029
II. Moderate, statistically significant impact				
10	Amazon.com Inc.	0.470	0.310	0.062
11	Coca-Cola Co.	0.480	0.265	0.085
III. Insignificant impact				
12	Johnson & Johnson	0.340	0.211	0.132
13	Procter & Gamble	0.310	0.178	0.151
14	Citigroup Inc.	0.210	0.112	0.254
15	Johnson Controls Intl. PLC	0.203	0.201	0.265
16	PepsiCo Inc.	0.101	0.219	0.242
17	Oracle Corp.	0.067	0.008	0.830
IV. Negative but insignificant impact				
18	IBM	-0.063	0.051	0.593
19	Philip Morris International Inc.	-0.280	0.125	0.390
20	Visa Inc.	-0.348	0.188	0.284

The hypothesis about the positive impact of innovation on the financial sustainability of companies is generally confirmed for more than half of the analysed international companies (11 out of 20), with the most reliable confirmation observed among technology and pharmaceutical companies (Microsoft, Intel, Cisco, Pfizer, AbbVie), as well as among companies operating in the consulting and service sector (Accenture, CBRE, Ecolab). At the same time, there was no significant impact for companies with a traditional or less innovative profile (Philip Morris, P&G, Citigroup). We can interpret these results of the regression analysis by concluding that innovation is a more important factor in improving financial sustainability for companies operating in intellectually intensive and dynamic industries.

The results of the analysis based on regression model 3 (the impact of employee engagement and development on innovation) are presented in Table 7.

Table 7. Results of the analysis based on regression model 3 (impact of employee engagement and development on innovation).

No.	Company	β	R^2	P-value
I. Strong and statistically significant impact				
1	Amazon.com Inc.	10.007	0.934	0.000
2	Ecolab Inc.	2.717	0.691	0.007
3	Intel Corp.	2.359	0.651	0.010
4	IBM (International Business Machines)	2.048	0.527	0.044
II. Moderate and statistically significant impact				
5	AbbVie Inc.	1.928	0.716	0.006
6	Alphabet Inc.	1.875	0.524	0.042
7	Citigroup Inc.	1.663	0.592	0.028
8	Coca-Cola Co.	1.616	0.522	0.042
9	Visa Inc.	1.348	0.828	0.001
III. On the verge of significance (trend)				
10	Oracle Corp.	1.262	0.484	0.055
11	Philip Morris Intl. Inc.	1.163	0.490	0.053
12	Microsoft Corp.	2.676	0.433	0.073
IV. Insignificant impact				
13	Pfizer Inc.	0.873	0.250	0.170
14	Procter & Gamble Co.	0.527	0.152	0.279

(continued on next page)

Table 7. Continued.

No.	Company	β	R^2	P-value
15	Johnson & Johnson	0.510	0.214	0.204
16	Johnson Controls Intl. PLC	0.410	0.102	0.380
17	PepsiCo Inc.	1.251	0.359	0.112
V. Negative impact (but not significant)				
18	Cisco Systems Inc.	-0.352	0.045	0.603
19	CBRE Group Inc.	-0.922	0.240	0.209
20	Accenture PLC	-2.137	0.342	0.129

The third hypothesis about the positive impact of employee engagement and development on the innovativeness of companies is generally confirmed. For 9 companies (45%), the relationship is strong or moderate and statistically significant, and taking into account three more companies with a tendency to significance, the share increases to 60%. The leaders in terms of the impact of human capital on the innovation level of enterprises are technological and innovation-oriented companies, such as Amazon, Intel, IBM, Alphabet, and Ecolab.

It should be noted that the indirect economic effect of the relationship between the latest technologies, human capital, and financial results at the studied enterprises is achieved by performing work with lower labour costs due to the optimisation and acceleration of processes involving the latest technologies. For example, the effectiveness of HR processes and companies' operations is significantly affected by the creation of a unified information space and a real-time data exchange network; introduction of information and management systems, automated and digital management systems, and even data centres at all levels of HR management; an electronic decision support system in the field of organising the activities of enterprise personnel.

A unified information space and real-time data exchange network significantly reduces the time for decision-making due to the timeliness and reliability of information; ensures the efficiency of managing the HR department's forces and resources; and ensures consistency of actions in the performance of tasks. In addition, the information and calculation capabilities of data exchange networks make it possible to combine the efforts of the HR department and analytical and financial units and ensure their massive application. Information technology systems, automated management systems, and data centres ensure that companies achieve their objectives with the available workforce and funds, as well as respond quickly to changes in the economic environment and HR processes. A digital decision support system enables the modelling of a large number of options for improving HR processes, which allows HR managers and employees to choose the best option for the task at hand. Thus, the cost-effectiveness of the HR management system with the use of the latest technologies enables business managers to organise the activities of employees at the lowest cost, which, accordingly, affects the financial performance of the company.

DISCUSSION

The results of the study confirm the presence of statistically significant relationships between the level of HR innovations, human capital development, and financial stability of companies, which is fully consistent with modern trends in scientific research in the theory of personnel management. In particular, proving the positive impact of innovations on employee engagement and development is fully consistent with the conclusions made by McKinsey researchers (2023), which prove the key role of investing in human capital as a catalyst for increasing productivity and innovativeness of companies. Both studies record a direct relationship between the use of modern HR technologies and the formation of high-quality human capital. However, our work demonstrates the advantage of covering a wide sample of transnational corporations operating in Central and Eastern Europe, in particular in Ukraine, Poland, Latvia, and Bulgaria, which allows us to make generalizations for the regional context.

For comparison, the results of a systematic review presented in the Oxford Review, which summarized the results of 21 empirical studies on the impact of HR technologies on company performance, were also analyzed. In this context, our article stands out favorably due to the formalization of three interdependent models built on real performance indicators of 20 international companies. This approach allows us to identify not only the presence, but also the strength and direction of influence between key variables: innovation, human capital, and financial efficiency (Oxford Review, 2024).

The results of our study confirm the modern scientific paradigm, according to which HR innovations act as a strategic resource for the development of human capital and ensuring financial sustainability. At the same time, the proposed empirical models provide an opportunity to more deeply understand the dynamics of these relationships in the corporate

DOI: 10.55643/fcaptp.5.64.2025.4859

environment of international companies operating in European countries, which is the main advantage of the presented work compared to existing scientific publications.

CONCLUSIONS

The study achieved its goal - a comprehensive analysis of the effectiveness of implementing the latest HR technologies at enterprises was carried out, taking into account the relationships between the level of innovation, human capital development and financial stability of companies. Based on empirical data from leading international companies for the period 2017–2024, three regression models were built, which allowed us to statistically substantiate the relationships between key variables.

The study conducted by means of regression analysis made it possible to confirm the validity of all three hypotheses. In particular, hypothesis H_1 was confirmed by the statistically significant results of the model, which demonstrated a positive relationship between the level of innovation and employee engagement and development. This suggests that companies that invest in the latest technologies and innovative processes are more active in implementing human capital development practices, creating an environment of learning, adaptation, and professional growth. Hypothesis H_2 was also empirically confirmed, as a statistically significant positive relationship was found between the level of innovation and financial sustainability. This means that the innovative activity of companies contributes to their financial efficiency, competitiveness, and ability to develop in the long term. Hypothesis H_3 was proved on the basis of a model that established a positive correlation between employee engagement and development and the level of company innovation. This emphasises the importance of building internal innovation potential through investing in staff, including the development of competencies, flexibility, creativity, and investing in the latest HR solutions. Thus, the results obtained confirm the existence of interconnected influence in the system 'innovation - human capital - financial efficiency'. Effective human resources management is not only a prerequisite for innovation but also a factor in improving financial stability, while the latest technologies serve as a catalyst for the development of both internal resources and the company's competitive position in the global market.

The results obtained open up a number of prospects for further scientific research, in particular, by expanding the geography of the analysis by including companies from other regions of the world, which will allow us to verify the universality of the identified patterns; deepening the analysis by taking into account additional factors, such as, for example, social and environmental responsibility, which can modify or strengthen the studied relationships; developing the research methodology through the use of nonlinear models, structural modeling (SEM), time lag analysis, etc.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

FUNDING

The Authors received no funding for this research.

CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

REFERENCES

1. Ali, R., Ateeq, A., Al Ani, Z., & Ali, S. A. (2023). Critical review of contemporary trends and challenges in human resource management. *International Journal of Intellectual Human Resource Management, 4*(2), 22–27. https://journals.gulfuniversity.org/index.php/ijihrm/article/view/168/122
2. AP News (2024). Intel's AI program offers free training to community colleges. https://apnews.com/article/26772553fe7ed82b535b41a8169ac078
3. Aydın, O., Karaarslan, E., & Narin, N. G. (2024). Artificial intelligence, VR, AR and metaverse technologies for human resources management. ResearchGate. https://www.researchgate.net/publication/371632346
4. Bhuwaneshwari, R., Udagi, K., & Huggi, M. M. (2023). Transforming human resource management in the digital era: Trends, challenges, and strategic implications.

ShodhKosh: Journal of Visual and Performing Arts, 4(2). https://doi.org/10.29121/shodhkosh.v4.i2.2023.4494

5. CTIL (2025). Johnson Controls International (JCI) adopted CTS one-stop HR and payroll outsourcing services. https://ctil.com/english/content/johnson-controls-international-jci-adopted-cts-one-stop-hr-and-payroll-outsourcing-services
6. D'Souza, M. C., & Paiithannkar, M. (2022). The impact of artificial intelligence (AI) on the transformation of recruitment processes. *International Journal of Electrical and Electronics Engineering Trends, 9*(2), 188–194. https://ijoeete.com/wp-content/uploads/2024/09/29-max-d.pdf
7. Drucker Institute (2025). Who Are America's Best-Managed Companies. Company rankings. https://drucker.institute/company-rankings/
8. Elbadawi, M. A. (2024). Exploring the impact of AI on employee engagement and productivity in human resource management. Achieving sustainable business through AI, technology education and computer science Springer, 541–550. https://doi.org/10.1007/978-3-031-70855-8_46
9. Elsayir, H. A. (2024). An overview on comparative methodology of classical OLS and two-stage techniques in regression analysis model. *Journal of Jilin University (Engineering and Technology Edition), 43*(10). https://doi.org/10.5281/zenodo.14196326
10. i4cp (2025). Ecolab applies a next practice to create a global contingent talent solution. Institute for Corporate Productivity. https://www.i4cp.com/interviews/ecolab-applies-a-next-practice-to-create-a-global-contingent-talent-solution
11. IBM. (2025). AI + human resources. https://www.ibm.com/ai-human-resources
12. IBM. Axios (2024). Five questions with IBM's Nickle LaMoreaux. https://www.axios.com/local/austin/2024/03/25/five-questions-with-ibms-nickle-lamoreaux
13. Indradevi, R., Sathya, N., & Baskar, B. (2024). Technology-enabled HR practices for successful implementation of SHRM. *International Research Journal of Multidisciplinary Scope (IRJMS), 5*(2), 427–440. https://www.irjms.com/journal/technology-enabled-hr-practices-for-successful-implementation-of-shrm/
14. Johnson & Johnson (2025). Experienced Human Resources Leadership Development Program (E-HRLDP). https://www.careers.jnj.com/en/jobs/r-003666/experienced-human-resources-leadership-development-program-e-hrldp-china-full-time/
15. Johnson & Johnson (2025). Leadership development programs: Human resources. https://www.careers.jnj.com/en/student-opportunities/leadership-development-programs/experienced-human-resources/
16. Kalenyuk, I., Grishnova, O., Tsymbal, L., Djakona, A., & Panchenko, E. (2020). Formation of intellectual corporate capital: methods and moderntrends. *Bulletin the National academy of sciences of the Republic of Kazakhstan, 1*(383), 182-191. https://doi.org/10.32014/2020.2518-1467.23
17. Kale, H., & Anute, N. B. (2022). HR analytics and its impact on organizations' performance. ResearchGate. https://www.researchgate.net/publication/362678194_HR_Analytics_and_its_Impact_on_Organizations_Performance
18. Lehmann, J., & Beckmann, M. (2024). Digital technologies and performance incentives: Evidence from businesses in the Swiss economy. arXiv. https://arxiv.org/abs/2412.12780
19. Parvathi, R., & Inampudi, P. (2024). Recent trends in human resource management: A review. *The Academic, 2*(7). https://theacademic.in/wp-content/uploads/2024/08/27.pdf
20. Puspita, R. A. S. (2024). The influence of digital technology on human resource management practice. *Productivity: Journal of Management Studies, 1*(1), 1–12. https://ppipbr.com/index.php/productivity/article/view/30
21. Rouse, M. (2024). Oracle HCM introduces role-specific activity centers. Lifewire. https://www.lifewire.com/oracle-hcm-role-specific-activity-centers-8682226
22. SHRM (2024). Evolving the strategic workforce planning strategy at PepsiCo. Society for Human Resource Management. https://www.shrm.org/executive-network/insights/people-strategy/evolving-strategic-workforce-planning-strategy-pepsico
23. Srivastava, S. (2024). Transforming talent acquisition: How AI is shaping modern HRM. *International Journal of Science and Research Archive, 13*(2), 1236–1244. https://doi.org/10.30574/ijsra.2024.13.2.2252
24. Steele, L. M., & Watts, L. L. (2022). Managing technical innovation: A systematic review of 11 leader functions. Technovation, 115, 102539. https://doi.org/10.1016/j.technovation.2022.102539
25. Tessema, S. A., Yang, S., & Chen, C. (2025). The effect of human resource analytics on organizational performance: Insights from Ethiopia. *Systems, 13*(2), 134. https://doi.org/10.3390/systems13020134
26. The Register (2025). Amazon deploys more algorithmic tools to manage its warehouse workforce. https://www.theregister.com/2025/03/18/amazon_algorithmic_worker_management/

DOI: 10.55643/fcaptp.5.64.2025.4859

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HR-ІННОВАЦІЇ, ЛЮДСЬКИЙ КАПІТАЛ І ФІНАНСОВА СТІЙКІСТЬ: ВЗАЄМОЗВ'ЯЗОК І ВЗАЄМОВПЛИВ НА ПРИКЛАДІ МІЖНАРОДНИХ КОМПАНІЙ

У роботі здійснено комплексний аналіз ефективності впровадження новітніх HR-технологій на підприємствах у контексті взаємозв'язку між рівнем інновацій, розвитком людського капіталу та фінансовою стійкістю компаній. Метою дослідження є емпіричне обґрунтування статистично значущого впливу HR-інновацій на залучення й розвиток працівників, фінансові результати діяльності, а також оцінка зворотного впливу людського капіталу на інноваційний потенціал компанії.

У межах дослідження було сформульовано три гіпотези щодо наявності прямого та зворотного впливу між ключовими змінними. Перевірку гіпотез здійснювали шляхом побудови трьох окремих лінійних регресійних моделей із використанням методу найменших квадратів (OLS). Статистична база включає панельні дані за 2017–2024 роки за 20 провідними міжнародними компаніями, що провадять діяльність зокрема на території України, Польщі, Латвії та Болгарії. Джерелом даних є відкриті щорічні звіти Інституту Друкера (Claremont Graduate University, США), що забезпечує високу достовірність і порівнюваність даних.

На основі аналізу позицій компаній у багатовимірному рейтингу ефективності (який включає п'ять ключових компонент: задоволеність клієнтів, розвиток персоналу, інновації, соціальна відповідальність, фінансова стійкість) установлено, що компанії-лідери за інноваційними показниками (Microsoft, Amazon, Johnson & Johnson) також демонструють високі результати за показниками ефективності управління персоналом і фінансами. Ці компанії активно впроваджують сучасні HR-технології, зокрема засоби автоматизації рекрутингу, платформи для навчання й розвитку, системи оцінювання ефективності персоналу на основі даних (HR-аналітика), що сприяє зростанню продуктивності, адаптивності та конкурентоспроможності.

Для оцінки сили та значущості впливу використані коефіцієнти детермінації R^2, β-коефіцієнти та p-value. Результати регресійного аналізу засвідчили наявність сильного й статистично значущого позитивного впливу рівня інновацій на розвиток людського капіталу (модель 1), а також фінансову стійкість компанії (модель 2). У свою чергу, модель 3 підтверджує зворотний позитивний вплив залученості та розвитку працівників на інноваційність підприємств, що підтверджує існування двостороннього зв'язку між людським капіталом та інноваціями.

Ключові слова: людський капітал, управління людським капіталом (HCM), новітні технології, управління людськими ресурсами (HRM), HR-технології, фінансова стійкість, цифрові технології, штучний інтелект, великі дані, хмарні технології

JEL Класифікація: J24, M12, O33