Innovation-Oriented HR Strategy Transformation and Business Model Reengineering: Empirical Insights from Ukrainian Agribusiness

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Abstract: This article explores the ongoing scientific discourse surrounding the transformation of innovation-oriented HR strategies and the reengineering of business models in Ukrainian agricultural enterprises amid the expansion of the digital economy. Particular emphasis is placed on the application of the integral strategizing paradigm and the use of the Tereshchenko model, which enables the integration of digital, value-based, and behavioural dimensions into a unified HR business architecture. The research employs factor analysis to assess the need for business process optimization across the following indicator groups: the integral vector of enterprise resource productivity (land, labour, and capital), reflecting resource efficiency; the integrated vector of business process profitability; the integrated financial vector; and the vector of business model effectiveness. This system of composite indicators offers a holistic evaluation of the systemic efficiency of agricultural enterprises, encompassing not only operational performance but also strategic, organizational, and cultural dimensions. The proposed methodology serves as a meta-analytical framework, synthesizing the HR strategy, resource management, and innovation-driven development. The study reveals that the Tereshchenko model offers a strategic advantage for Ukrainian agribusinesses by coherently aligning the business model, organizational culture, resource use, and employee behavioural dynamics. This approach is particularly relevant in the context of post conflict recovery, digital transformation, and demographic challenges facing the sector. The study's findings support the enhancement of HR strategies in agricultural enterprises through the adoption of AI-based forecasting and workforce planning, digital recruitment tools (such as chatbots, online surveys, and digital platforms), and the implementation of HRM systems to automate human resource functions. These measures aim to align human capital with evolving business environments and facilitate the adoption of modernized business models.

Keywords: HR strategy, optimization, innovative business model, agriculture, cluster, factor analysis, integrated vectors, digital economy.

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1. Introduction. In the modern era of digitalization, all sectors of the economy are undergoing profound transformation, presenting both new challenges and opportunities for businesses. One of the most critical resources for gaining a competitive advantage is human capital, the effective management of which requires the adaptation of HR strategies to the realities of the digital economy. Digital technologies are reshaping approaches to recruitment, motivation, training, and employee retention. Artificial intelligence, big data analytics, cloud services, and remote work necessitate new, agile HR strategies capable of responding swiftly to change. The development of a flexible and innovation-driven business model enables enterprises to integrate digital tools into organisational processes, optimize costs, increase productivity, and increase customer value. These models are built on digital platforms, strategic partnerships, customer centricity, and adaptive management practices. The optimization of HR strategies and the implementation of an innovative management framework foster sustainable development, reduce employee turnover, increase workforce innovativeness, and improve responsiveness to dynamic market conditions.

Several theoretical approaches provide a foundation for implementing HR innovations, including the digital maturity model, strategic human resource management, the volatility, uncertainty, complexity, ambiguity (VUCA) framework, dynamic capabilities theory, and the design thinking approach. Each model presents distinct characteristics and offers theoretical justification for the adoption of HR innovations in contemporary organisations. The digital maturity model describes a staged progression (initial, development, integration, optimization, and innovation) through which enterprises evolve (Zhu et al., 2025; Festing & Proff, 2025; Guler & Buyukozkan, 2025). In this framework, HR innovations act as drivers of digital maturity, enhancing adaptability and organisational performance. Strategic human resource management emphasizes the alignment between HR innovations and organisational objectives. Analytical HR tools support data-driven decision-making, whereas the adoption of HR-tech solutions (HCM platforms, big data, and cloud systems) ensures scalability, flexibility, and predictability (Torkabadi et al., 2025; Nejatiyanpour et al., 2025; Manimaran et al., 2025). The VUCA framework underscores the necessity of flexible HR processes and adaptive talent management to effectively navigate unpredictable environments (Minciu et al., 2025; Boscoianu et al., 2024). Dynamic capabilities theory highlights the need for organisations to reconfigure internal resources by introducing new evaluation, motivation, and development mechanisms, enabling timely adaptation to shifting market conditions (Rehman et al., 2025; Tripathi et al., 2025; Jiang et al., 2025). The design thinking approach to HR centres on developing employee-focused solutions through empathy, iterative prototyping, and continuous testing, offering a systematic method for improving HR processes (Khushk et al., 2025; Thite, 2020). In addition to these approaches, theoretical models such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) provide insight into how employees adopt and interact with HR technologies. These models highlight the importance of perceived usefulness, ease of use, social influence, and facilitating conditions, factors that critically determine the success of HR-tech implementation. Furthermore, the resource-based view (RBV) offers a strategic perspective by framing digital HR capabilities as valuable, rare, inimitable, and embedded within the organization. From this viewpoint, the effective integration of digital HR tools (e.g., AI-based recruitment, predictive analytics, and cloud-based performance management) contributes directly to the development of sustainable competitive advantages (Madhani, 2010). Collectively, these theoretical perspectives provide a comprehensive foundation for analysing the drivers, barriers, and outcomes of HR digitalization in the broader context of strategic transformation and innovation.

Despite the growing academic interest in HR digitalization and business model innovation, limited research has explored how innovation-oriented HR strategies contribute to the reengineering of business models, particularly within the agribusiness sector in transition economies such as Ukraine. Most existing studies focus on general aspects of HR digital transformation or examine practices in advanced economies, often overlooking the sector-specific and regional factors that influence transformation trajectories. Moreover, there is a lack of empirical evidence linking HR-driven innovation to strategic business model adaptation in volatile, uncertain, and resource-constrained contexts, which are conditions characteristic of Ukrainian agribusiness. While models such as the TAM, UTAUT, and RBV offer valuable frameworks for understanding digital adoption and value creation, their application to the intersection of HR innovation and business model reengineering in agriculture remains underexplored. This research aims to address this gap by providing empirical insights from Ukrainian agribusiness enterprises undergoing transformation. By examining the role of digital and innovation-driven HR practices in enhancing adaptability, agility, and value creation, this study seeks to offer a context specific, evidence-based contribution to the evolving discourse on HR strategy and business model transformation. The research hypothesis posits that the implementation of an innovation-

oriented HR strategy positively influences the effectiveness of business model reengineering in Ukrainian agribusinesses by increasing adaptability, digital maturity, and organisational agility. Importantly, there is a direct correlation between the level of digitalization of HR functions (recruitment, training, talent management) and the flexibility of the operational model in agribusiness enterprises. Moreover, organisations that implement HR innovations (such as AI-based recruitment, HR analytics, and e-learning) demonstrate a higher level of readiness for business models adapted to a dynamic (VUCA) environment.

The remainder of the paper is structured as follows. The Literature Review section analyses existing scholarly contributions on HR management in the digital age, the development of modern business models in the agricultural sector, and the application of artificial intelligence in personnel selection. The Methodology and Research Methods section defines the object of the study and substantiates the methodological framework for transforming innovation-oriented HR strategies through the use of integral indicators and the Tereshchenko model. The Results section presents the testing of the proposed methodological approach, highlighting the influence of specific indicators on the formation of HR strategies under conditions of digital transformation. It also discusses the managerial implications of the findings. The Discussion section provides a comparative analysis of the obtained results in relation to existing research, primarily international studies. It justifies the improvement of the current business model of agricultural enterprises and outlines potential development trajectories. Finally, the conclusions summarize the key research findings and offer practical recommendations for the transformation of HR strategies. The section also identifies target stakeholders who may benefit from the results, including HR professionals, senior management, digital solution developers, and public institutions responsible for digital transformation in the agricultural sector.

2. Literature Review. Many scientists and researchers have developed innovative models of agricultural enterprises through the prism of technological changes. When modelling the business model, the author's team used design management (Pavlenko et al., 2023). Innovations and the associated digitalization of the global economy are becoming the basis of competitiveness and development. This state of affairs applies to all regions and countries of the world, especially enterprises that need to adapt to stay in the market. The situation is especially difficult in developing countries, whose economic potential is lower than that of developed economies (Tutak & Brodny, 2024). The authors studied the differences between the problems of sustainable development management in the agricultural sector and post-industrial farming (Vidickiene & Lankauskiene, 2025). The study used an interdisciplinary approach to form an innovative model that combines technological, environmental, economic and managerial knowledge (Vahdanjoo et al., 2025). The team of authors emphasizes that digitalization affects the socio-economic development of economic entities, the regional economy and the national economy as a whole (Kramarenko et al., 2022).

Modern research related to the development of HR strategies and human resource management is shaped by the influence of the digital age. Research on enterprise effectiveness is not only growing in the digital era (Bertello et al., 2021; Bresciani et al., 2021; Troise et al., 2022) but also shifting to examining how transnational entrepreneurs use digital technologies such as big data analytics and cloud computing to establish their enterprises (Chalmers et al., 2021; Sahut et al., 2021). The form of the transnational digital enterprise (Duan et al., 2021) combines elements of transnationalism and digital value creation from transnational entrepreneurship (Elo et al., 2022; Sinkovics & Reuber, 2021) and digital entrepreneurship (Kraus et al., 2019).

Digital transformation can overcome the innovation dilemma by improving innovation quality and enhancing the capacity for absorption and transformation. Furthermore, the impact of digital transformation features increasing returns to scale. State-owned enterprises, technological enterprises and growth enterprises are better able to solve the innovation dilemma through digital transformation (Zhuo & Chen, 2023). Authors (Zhuo & Chen, 2023) have clarified the relationship between digitization and innovation from a new perspective.

Organizational agility, which is the ability to anticipate or respond quickly to external changes, is essential to survive and compete in today's turbulent landscape and is characterized by technological advancements and digitalization (Troise et al., 2022). Research on the capabilities that enable firms to be agile in so-called VUCA environments is still nascent. Hence, it is important to explore the antecedents of firm agility and to identify the factors enabling them to compete better (Troise et al., 2022). Even more so, in the case of SMEs, as they are more vulnerable in hypercompetitive business environments, agility has been less studied in this context. Focusing on SMEs, this study investigates three antecedents of agility, namely, digital technology capability, relational capability and innovation capability, and the effects of agility on three outcomes, namely, financial performance, product innovation, and process innovation (Troise et al., 2022).

Research (Troise et al., 2022) highlights that innovation capability and both digital technologies and relational capabilities help firms build organizational agility and that, in turn, agility has a positive effect on financial and innovation (in terms of product and process) performance, thus confirming that agility contributes to the success of SMEs and that digital technologies play a central role in this process.

An approach to enabling an organization's strategy that positions skills at the centre of HR strategy. It offers a more agile approach to matching worker skills with available and potential opportunities. Skills-first HR values skills over education and experience, whereas data and technology enable the mapping of current employee skill profiles to emerging skill demands (Collings & Mackin, 2025).

The next revolutionary technology that will have an impact on society in the coming decades is called metaverse, which allows immersive encounters in both virtual and real-world environments. The metaverse, while still in the concept stage, merges the digital and physical realms, allowing users to move easily between them (Cristache et al., 2024).

The term metaverse is currently very popular and is associated with an innovative concept that promises to transform the way companies operate and innovate. The metaverse refers to a persistent and shared virtual universe where users can interact with each other and with digital objects in an immersive environment. The term metaverse was first used by Neal Stephenson in 1992 in his novel Snow Crash (Stephenson, 1992), but the term has now evolved significantly because of digitization, which is associated with virtual reality (VR), augmented reality (AR) and other digital technologies. The term encompasses the prefix "meta", meaning virtuality, and "verse", meaning the world (Wu & Ho, 2023).

Large technology companies in different countries have invested heavily in this technology (Firmansyah & Umar, 2023). Moreover, with a significant increase in interest in sustainable innovation and economic performance, the metaverse can play a very important role in driving business innovation (Wu & Ho, 2023).

In the era of a global and competitive knowledge-based economy, business innovation plays a key role in shaping operations and efficiency, significantly impacting the development of national economies (Kraus et al., 2021; Srisathan et al., 2023). Currently, these processes are driven by digitization in its broadest sense, which is becoming a key factor in supporting business innovation, especially in developing countries (Calderon-Monge & Ribeiro-Soriano, 2024; Radicic & Petković, 2023; Wu et al., 2022).

In today's world, innovation and digitization play crucial roles in fostering sustainable development within national and regional economies. Without innovative solutions, achieving development and enhancing competitiveness in economic activities becomes challenging. The topics of innovation and digitization are therefore highly pertinent and widely discussed in numerous publications. Researchers focusing on these areas emphasize their importance for businesses and the broader economic and social development of countries (Dabbous et al., 2023; Kraus et al., 2021; Martínez-Pelaez et al., 2023).

It is impossible to overstate the role of artificial intelligence in supporting personnel, which is why today, a significant part of scientific research is devoted to this issue. By examining this relationship through the lens of the job demands-resources (JD–R) model, this study aimed to provide insights into how health workers' perceptions of AI integration in their jobs and careers could influence their informal learning behaviour and, consequently, their overall well-being in the workplace (Arboh et al., 2025). The study revealed the need for personalized platforms adapted to the user level, an appropriate direction through navigation, a crisis management support system, communication and information exchange between users, and an expert liaison service (Lee et al., 2025). The authors of the publication believe that artificial intelligence will become increasingly important in health crisis situations, but only if it is thoughtfully integrated into existing systems and processes (McKee et al., 2025). Through case analysis and practical guidance, this paper summarizes the lessons learned to avoid challenges and problems in the application of AI technology, which can help enterprises better utilize AI technology to promote long-term development and competitive advantages (Chen & Liu, 2024).

When an HR strategy is formed, various methodological approaches are used, including the expert assessment method (Mammadova & Jabrayilova, 2018), SWOT analysis (Vafin et al., 2017), and the Delphi method (Abdeldayem et al., 2024). However, we believe that the use of integral indicators in the formulation of the HR strategy offers a comprehensive and data-driven approach to managing complex, multidimensional processes. These indicators increase strategic clarity, allow cross- and time-based comparisons, and support evidence-based decision-making. In the context of digital transformation and environmental volatility, integral indicators also provide a dynamic mechanism for tracking the adaptability of the organization and the development of human capital.

In the course of theoretical research, scientists have used the digital maturity model, RBV, UTAUT, VUCA, and design thinking to optimize the HR strategy. It is evident that for agricultural enterprises, the use of the Tereshchenko model (Tereshchenko, 2006) with a combination of integral vectors will allow moving from fragmentary analysis to holographic diagnostics of the organization, where HR is not just a function but a catalyst for strategic changes, which forms a fundamentally innovative approach.

Believe that the Tereshchenko integral model provides a heterochronous and heteroarchic analysis of organizational dynamics, which allows us to synthesize HR analytics not as a statistical function but as a meta-analytical practice of organizational sensemaking and evolution. Compared with classical analytics models, which mainly use an empirical-descriptive approach (KPI analysis, staff retention, and recruitment effectiveness), Tereshchenko's integral model has epistemological multidimensionality: empirical level (metrics and productivity), interpretive level (meaning, experiences, and narratives), critical level (structural power and cultural hegemonies) and systemic level (interdependencies and synergies).

The Tereshchenko model in an integrated approach allows one to move from operational efficiency to strategic compliance, which is the key to systemic business transformation. The advantage of the model is the cartography of strategic business guidelines combined with the HR value matrix, while HR strategies are not created autonomously but are based on synchronization with the business mission and its evolutionary stage.

3. Methodology and research methods (for research and theoretical papers).

3.1. Data

The choice of an agricultural enterprise located in southern Ukraine during wartime is based on several critical considerations. First, agriculture is a strategically vital sector of the Ukrainian economy, playing a key role in food security, export capacity, and rural employment, particularly in times of crisis. Second, southern China has been among the regions most affected by military aggression, which has drastically disrupted human resource processes, causing labour shortages, migration, psychological stress, and an urgent need for digitalization and adaptive HR practices.

Under such extreme conditions, the HR strategy must go beyond conventional workforce management to ensure resilience, flexibility, and rapid adaptation to the VUCA environment. This context provides a unique opportunity to examine the practical effectiveness of HR innovations and data-driven approaches, making the selected case both socially significant and scientifically robust. This enables the validation of the proposed strategy in high-risk scenarios, enhancing the reliability and generalizability of the research outcomes.

To test the proposed approach, the effectiveness of the current business model of the agricultural enterprise “Semenivskyi Agroservice” LLC (2025) has been studied. The legal address of the enterprise is as follows: Mykolaiv region, Arbuzynskyi district, village Semenivka, 28 Shkilna Street. The main types of economic activities of the company are as follows:

– Growing cereal crops (except rice), leguminous crops, and oilseeds.

– Supporting activities in crop production.

– Wholesale trade in grain, unprocessed tobacco, seeds, and animal feed (“Semenivskyi Agroservice” LLC, 2025).

The enterprise was established in 2000 and has not changed its type of economic activity. The company leases 12 land plots with a total area of 75 hectares. Currently, it specializes in the cultivation and sale of the following agricultural crops: winter wheat, barley, sunflower seeds, and rapeseed.

Research has shown that enterprises currently use traditional agricultural methods, partially incorporating modern methods for pest and weed control. However, modern digital technologies are not applied in the main production processes. As a result, crop yields depend, among other factors, on unpredictable weather conditions, temperature, and humidity.

According to the statistical data, there is a noticeable decline in the yields of the main crops that the company specializes in cultivating. Additionally, the yield of these crops is, on average, 20% lower than that of enterprises that use advanced technologies. This indicates that some production business processes need to be modernized, taking into account modern precision farming technologies, land treatment, and irrigation organization.

Despite the slight decrease in yield, statistical reporting data show that the enterprise remains profitable and efficient. In 2023, the company earned a net profit of UAH 33,935 thousand, which is 34% higher than that in 2020 and 126% higher than that in 2022. The operational profitability of the enterprise in 2023 was 26%, which is a good indicator for an agricultural business, but it decreased by 13% compared with that in 2020 (“Semenivskyi Agroservice” LLC, 2025).

3.2. Methods

Notably, in today's rapidly changing market environment, the efficiency and competitiveness of enterprises depend on their level of innovation activity. Most businesses require reengineering their business models, which must adapt quickly to market conditions and the digital reality. In this context, the HR strategy serves as a supporting strategy in relation to the overall organizational strategy and the selected business model for its implementation.

A company's business model is a structured approach to how it operates, leveraging its competencies and resources to create a product or service that meets customer needs and generates profit. Under current conditions, the fundamental prerequisite for optimizing the personnel management system is, first and foremost, the optimization of the organization's development business model on the basis of a process-oriented approach, the alignment of the human resource profile with the new model, and the development of an appropriate HR strategy.

The HR strategy encompasses many interconnected components, such as talent management, personnel development, digitalization, adaptability, and cost efficiency. Thus, integral indicators allow these disparate data to be combined into a single measurable index, which provides a generalized and objective picture. Owing to the aggregation of indicators, the integral model reduces the risk of subjectivity in decision-making and improves the predictability of the impact of HR initiatives on the overall effectiveness of the organization. Integral indicators allow one to compare different divisions, companies or time periods, which is important for assessing the progress of digital transformation or innovative development of HR functions. Forming an HR strategy on the basis of integral indices corresponds to the modern approach to HR analytics, where decisions are based on evidence, not intuition. This is especially relevant in the digital economy. Owing to their sensitivity to changes in various HR subsystems, integral indicators allow one to quickly identify imbalances and adapt the strategy to new challenges (for example, war, personnel migration, and technological breakthroughs).

Integration of an innovation-oriented HR strategy with business model reengineering based on an integral approach (in particular, the Tereshchenko model) allows Ukrainian agricultural enterprises to increase the systemic efficiency of functioning through the coordination of resource productivity, behavioral mechanisms of personnel and strategic business goals in the context of digital transformation. The use of factor analysis allows the following: to identify latent (hidden) structures of relationships between variables that determine the effectiveness of the HR strategy and the business model of the enterprise; to group relevant indicators by internally consistent factors that represent key vectors of organizational transformation (for example, resource productivity, process profitability, financial stability, innovative flexibility); to reduce the dimensionality of the research space while maintaining the analytical significance of the primary data; and to create integral indicators that can be used to build predictive models of transformation in agribusiness.

This is why the use of integral indicators on the main Tereshchenko models will allow one to determine the best components for the HR strategy that will allow the business entity to develop. For a rapid assessment of an enterprise's need to optimize business processes, propose the following groups of indicators:

1. The integrated productivity vector of enterprise resource utilization (land, labour, means of production), which characterizes the efficiency of resource use in an agricultural enterprise over the dynamics of the last several periods, is calculated via the following formula:

$$PR = \sum_{t=3}^{n} \left(\frac{Q^t}{KR^t} / \frac{Q^{t-1}}{KR^{t-1}} \right) \times 100 - 100 \quad (1)$$

where PR is the productivity of resource use; Q is the volume of output in physical terms; KR is the number of resources used in physical terms; and t is the period under study.

The use of physical (natural) indicators at this stage reduces the potential impact of inflation on the calculation results. The results obtained with a "+" sign indicate that productivity under the given technology has not declined. This suggests the relative efficiency of the production business processes.

2. Integrated vector of business process profitability:

$$R = \sum_{t=3}^{n} \left(\frac{P^t}{KR^t} \times 100 \right) - \left(\frac{P^{t-1}}{KR^{t-1}} \times 100 \right) \quad (2)$$

where R – vector of business process profitability; P – enterprise profit, monetary units; and KR – resources used in value terms.

The profitability of resource use reflects the efficiency of commercial, market, and managerial business processes.

3. Financial conditions reflect the efficiency of business processes at the enterprise level. An enterprise approaching bankruptcy is an important signal that business process reengineering is needed. The financial condition of an enterprise typically has a cumulative effect. Therefore, to derive this indicator, models for assessing the probability of enterprise bankruptcy can be used. For example, the model by O.O. Tereshchenko. According to this model, the probability of bankruptcy can be determined via the following formula:

$$Z = 1.5x_1 + 0.8x_2 + 10x_3 + 5x_4 + 0.3x_5 + 0.1x_6 \quad (3)$$

where x_1 = Cash − Flow/ liabilities; x_2 = total assets / liabilities; x_3 = profit/total assets; x_4 = прprofit / revenue; x_5 = inventory / revenue; and x_6 = sales revenue/total assets.

The obtained values of the indicator Z can be interpreted as follows: Z > 2 – the enterprise is financially stable, and bankruptcy is not a threat; 1 < Z < 2 – the enterprise has disrupted financial equilibrium (financial stability), but bankruptcy is not a threat, provided that it adopts anti-crisis management; 0 < Z < 1 – the enterprise is at risk of bankruptcy if it does not take corrective measures; Z < 0 – the enterprise is semibankrupt (Vlasyuk et al., 2017).

To consolidate the indicators into a unified measurement system, the following formula is proposed:

$$F = \left(\frac{Z^t}{2} / \frac{Z^{t-1}}{2}\right) \times 100 - 100 \quad (4)$$

where F – the integrated financial vector of an enterprise, which can take values of (+) or (-), characterizes the direction of the financial movement of the enterprise towards either increasing its stability or heading towards bankruptcy.

Thus, the need for an enterprise to undergo reengineering or apply another method of optimizing business processes can be mathematically expressed via the following formula:

$$\overline{N} = PR + R + F \quad (5)$$

where $\overline{N} \in (0; y)$ is the efficiency vector of the enterprise's business model.

In this case, $\overline{N} < 0$ – the enterprise requires reengineering of business processes; $\overline{N} = 0$ – the enterprise requires optimization or reorganization of individual business processes, as it is in a state of stagnation; $\overline{N} > 0$ – the business processes are effective under the given technical and economic conditions; however, the enterprise may apply reengineering if there is a need to change technologies.

3.3. Validation

To verify the reliability and validity of the obtained results, an integral indicator based on the Tereshchenko model was applied. This approach enables the aggregation of multiple qualitative and quantitative HR criteria into a unified index, offering an objective assessment of the digital transformation level of the HR strategy. Reliability was assessed through consistency coefficients of expert evaluations, whereas validity was ensured by comparing the integral index with actual performance indicators of HR functions and the outcomes of business model reengineering.

According to the State Statistics Service of Ukraine, the share of small agricultural enterprises is 97.6% of the total number of agricultural enterprises, whereas medium and large farms account for only 2.4%. This disparity indicates a high structural concentration of the agribusiness environment in the small business segment.

In this context, the analysis of the HR strategy of an enterprise, which demonstrates representative business processes for the agricultural sector, acquires universal significance. Despite the scale or institutional form of ownership, most farms operate according to similar management and organizational patterns, which allows extrapolation of the results of the study to a wider cluster of enterprises.

This is why the application of an integral approach within the Tereshchenko model to this case serves as a methodological basis for generalizing effective HR transformation practices (identifying key vectors of

personnel management optimization, building an adaptive HR architecture, and forming value-oriented motivation models).

Thus, the considered case performs a heuristic function—as a typical but also transformative enterprise—which can serve as a model for the multiplicative application of the Tereshchenko Model in the field of agricultural HR management.

4. Results. Notably, the enterprise under study has experienced asset growth, particularly in terms of noncurrent assets. This indicates active investment activity by the company. Over the study period, the company's assets grew by 71%, including fixed assets, which increased by 25.6%. A 23% reduction in the depreciation level of fixed assets indicates capital investment in fixed assets, particularly in the purchase of new equipment for land cultivation and transportation. Moreover, the analysis of the statistical reports revealed that the company has no intangible assets on its balance sheet, which indirectly indicates a low level of innovation activity within the company. The main indicators of the economic activity of the "Semenivskyi Agroservice" LLC are presented in Table 1.

Table 1. Dynamics of key indicators of economic activity of "Semenivskyi Agroservice" LLC.

Indicators	2020	2021	2022	2023	Growth, %
Number of employees, persons	55.0	52,0	45.0	48.0	-12.7
Assets, thousand UAH	85332.6	92278.3	99224.0	146511.0	71.7
Revenue from product sales, thousand UAH	66451.0	70400.0	60243.0	91959.0	38.4
Cost of produced goods, thousand UAH	39857.0	39543.7	44936.0	54562.0	36.9
Net profit, thousand UAH	25300.0	13300.0	12802.0	33935.0	34.1
Average annual value of fixed assets, thousand UAH	73878.8	67162.6	69961.0	92783.0	25.6

Source: Compiled by the author on the basis of the enterprise's reporting and statistical documentation.

At "Semenivskyi Agroservice" LLC, a classical linear-functional management structure is used, which involves the allocation of functional departments that report to the manager. The structure is simplified, as the company is classified as a small enterprise with fewer than 50 employees. Individual business processes are not separated.

The level of digitalization of management is below average. That is, specialists' workplaces are equipped with the necessary office equipment and internet access. Reporting and accounting work is carried out via software based on 1C. Direct communications with suppliers and clients are established on the basis of concluded contracts. Communication is primarily performed through email, with some use of specialized programs. However, decisions are made without the use of specialized software tools. Innovation activity in the company is almost nonexistent.

To determine the need for the company to reformat its business model, an express analysis was conducted according to the proposed methodology. In the first stage (Formula 1), the integrated indicator of the productivity vector of resource usage for the enterprise for 2020–2023 was determined. Table 2 presents the calculation results.

Table 2. Calculation of the integrated indicator of resource usage productivity for Semenivskyi Agroservice" LLC.

Indicators	2020	2021	2022	2023	PRi
Labor productivity, tons per person	3,80	3,50	3,77	3,70	
Growth compared to the previous year, %	-	-7,89	7,81	-2,00	-2,1
Productivity of fixed asset usage, tons per thousand UAH	0,0028	0,0027	0,0024	0,0019	
Growth compared to the previous year, %	-	-4,21	-10,44	-21,18	-35,8
Average yield, tons per hectare	3,07	2,70	2,43	2,57	
Growth compared to the previous year, %	-	-11,96	-9,88	5,48	-16,4
Integrated productivity vector (PR)					-54,3

Source: Developed by the authors.

The results of the calculations showed that the main business processes of the enterprise require certain optimization, as resource productivity has been decreasing over the studied period. In the next stage, the

integrated profitability indicator of the company's business processes was calculated (Formula 2). The calculation results are presented in Table 3.

Table 3. Calculation of the integrated profitability indicator of business processes for "Semenivskyi Agroservice" LLC.

Indicators	2018	2019	2020	2021	Ri
Operating profitability	22.0	18.9	21.3	26.3	-
Growth compared to the previous period	-	-3.1	2.4	5.0	4.3
Return on capital	29.6	14.4	12.9	26.0	-
Growth compared to the previous period	-	-15.2	-1.5	13.1	-3.6
Return on fixed assets	34.2	19.8	18.3	36.6	-
Growth compared to the previous period	-	-14.4	-1.5	18.3	2.3
Production profitability	30.0	33.6	28.5	32.0	-
Growth compared to the previous period	-	3.6	-5.1	3.5	2.0
Integrated profitability vector (R)	-	-	-	-	5.0

Source: Developed by the authors.

The integrated profitability vector has a positive value, which indicates the relative efficiency of the company's business processes under current market conditions. However, against the backdrop of a negative productivity vector, these results were achieved primarily through market factors, including an increase in product prices and a reduction in material procurement costs.

The next step is to calculate the probability of enterprise bankruptcy via Tereshchenko's approach (Formula 3) for the years 2020 and 2023. The calculated coefficients and the overall bankruptcy probability indicator (Z) are presented in Table 4.

Table 4. Financial condition coefficients of "Semenivskyi Agroservice" LLC.

Financial condition coefficients	2020	2023	Growth
x_1	2.17	1.74	-0.44
x_2	7.04	6.48	-0.56
x_3	0.30	0.23	-0.06
x_4	0.38	0.37	-0.01
x_5	0.14	0.16	0.02
x_6	0.78	0.63	-0.15
Z	8.81	7.40	-1.41

Source: Developed by the authors.

The calculations revealed that the financial condition indicator Z in both 2020 and 2023 is significantly greater than the normative value. This means that the enterprise is not at risk of bankruptcy. However, all the indicators in 2023 deteriorated compared with those in 2020, which is a negative trend. Using Formula 3, the financial vector of the enterprise was calculated to be -16.

Using the obtained results, the vector of the effectiveness of the business model of "Semenivskyi Agroservice" LLC was calculated (Formula (4)). The resulting indicator is -65. This means that the company needs to undergo reengineering of its business model, particularly its key business processes.

The company is financially stable and has a sufficient level of profitability. Therefore, it is suggested that companies enhance their innovation activity and implement precision farming technologies.

For the purpose of optimizing management processes at "Semenivskyi Agroservice" LLC, which is based on a process approach, outlined the current model of the enterprise, highlighting managerial, core, and auxiliary processes. The proposed innovative structure of business processes is shown in Figure 1.

The presented model graphically illustrates the core, supporting, and managerial business processes. The arrows indicate the connections between them, representing the inputs and outputs of each process, which can be formalized via a system of quantitative and qualitative indicators. This approach enhances the model's manageability, identifies bottlenecks, and allows for the simulation of a digital twin of the model to improve its overall controllability.

Methodological approaches for determining the need for an enterprise to update its business model are proposed, which are based on calculating the integrated efficiency vector of an analogue business model on the basis of the following components: the resource utilization productivity vector, the business model profitability vector, and the enterprise financial stability vector. A mathematical toolkit for performing

calculations via the proposed approach and options for interpreting the obtained data are developed. The use of the proposed approaches will allow for express diagnostics of the enterprise for the need to improve the management model or individual business processes as a basic prerequisite for the corresponding optimization of the HR strategy. Using the author's approaches, a diagnostic of the efficiency of the business model of the agricultural enterprise "Semenivsky Agroservice" LLC was carried out; as a result, it was determined that the enterprise needs to optimize the main business processes for the production of agricultural crops with the possible use of precision farming technologies. A model of the enterprise's business processes has been built, which, unlike the current mechanistic management structure, will increase the level of process control, identify "bottlenecks" and simulate a digital analogue of the model to improve management processes, improve the quality of management decisions and the enterprise's adaptive capabilities.

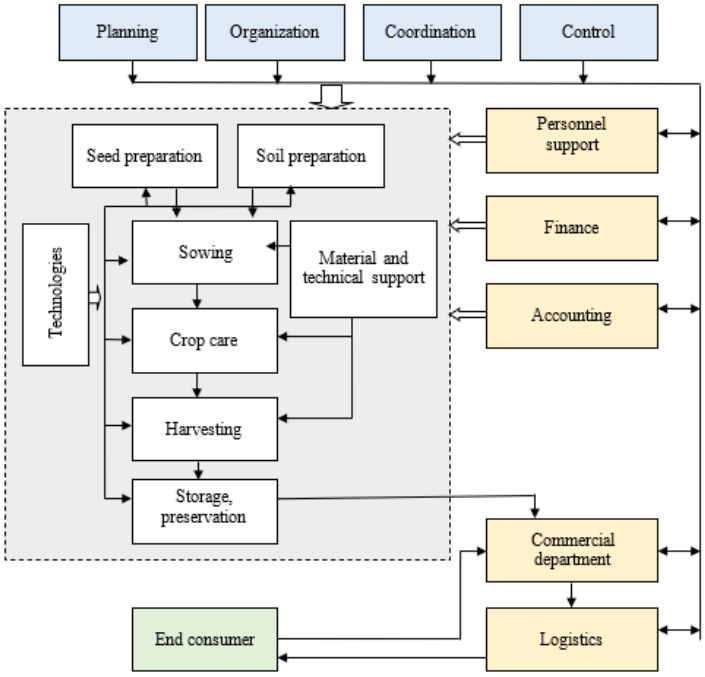

Figure 1. Oriented Innovative Business Model of "Semenivskyi Agroservice" LLC.
Source: Developed by the authors.

The presented model graphically illustrates the core, supporting, and managerial business processes. The arrows indicate the connections between them, representing the inputs and outputs of each process, which can be formalized via a system of quantitative and qualitative indicators. This approach enhances the model's manageability, identifies bottlenecks, and allows for the simulation of a digital twin of the model to improve its overall controllability.

The implementation of this model requires improvement of the company's PR strategy, as the proposed model is developed with consideration for the potential to create a digital twin of business processes as a foundation for enhancing production efficiency and administrative procedures. To identify the key areas for optimizing the PR strategy, the human resource profile was analysed (Fig. 2).

The calculation data indicate a certain imbalance in the job and qualification structure of the personnel. Specifically, there is an underutilization of employees' professional and qualification potential (9%). The company possesses sufficient capacity for developing and implementing a new business model. The age structure of the enterprise is also relatively optimal and, if the existing potential is maintained, will support the gradual replacement of retirement-age employees without a significant loss in labour productivity.

The key elements of the proposed HR management strategy for "Semenivskyi Agroservice" LLC, aligned with the needs of the model's implementation, are as follows:

– Forecasting and planning the quantitative and qualitative composition of personnel via artificial intelligence capabilities: training and upskilling administrative staff in digital skills; temporary engagement (outsourcing) of project design and IT specialists to develop an optimized business process model and its digital twin; calculation of projected labour productivity and functional cost analysis for each position, considering the expected outcomes of administrative function digitalization.

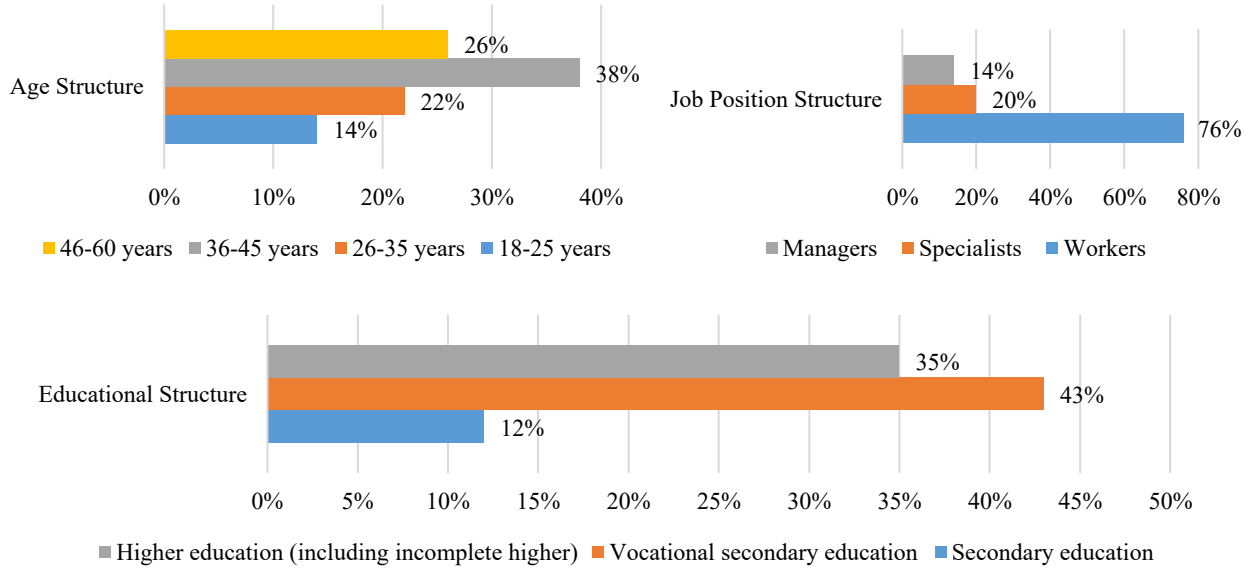

Figure 2. Human Resource Profile of "Semenivskyi Agroservice" LLC
Source: Developed by the authors on the basis of the company's reporting and statistical documentation

– Recruitment and hiring: job description development, setting clear selection criteria, substantiating motivational aspects, and using chatbots to answer routine questions; use of digital online platforms for job posting; resume analysis; candidate selection automation; online interviews; and skills assessment.

– Implementation of automated personnel administration systems: use of HRM systems (human resource management systems) for storing and updating data on employees, maintaining personnel files, vacation information, payroll, etc.; use of digital tools for performance evaluation, collecting feedback from colleagues and managers, creating individual development plans.

5. Discussion. The novelty and advancement of the proposed model, in comparison with other existing approaches, lies in the development and application of an integrated efficiency vector for evaluating the analogue business model. This vector is composed of three key components: the resource utilization productivity vector, the business model profitability vector, and the financial stability vector of the enterprise. As part of this study, a mathematical toolkit was developed for computing these indicators under the proposed framework. In addition, several options for interpreting the obtained data were designed, allowing for a more nuanced and decision-oriented assessment of business model effectiveness in the context of HR strategy transformation and digitalization. Thus, the company "Semenivskyi Agroservice" LLC has a sufficient level of economic and personnel potential to carry out the initial stage of forming and implementing a digital development model, which provides significant advantages for the management of the enterprise, namely, it will simplify the implementation of administrative functions through the creation of a unified information system (finance, planning, control, sales, personnel management); will allow reaching a new level of search for partners, customers and investors via modern digital network platforms; and will contribute to increasing the productivity of resource use and the gradual introduction of innovations in the field of direct cultivation of basic products.

The scientific research of a team of authors who considered the main approaches to integrating smart technologies into the production and management processes of agro-industrial clusters allows significant optimization of operational activities, reducing costs and increasing the competitiveness of products (Lutkovska et al., 2024). A 2023 study among SMEs in Bulgaria, Hungary, Poland, Serbia, etc., identified five critical drivers of digitalization: leadership, strategy, culture, the business environment, and the circular economy (Sima, 2018). The proposed approach resonates with these results: alignment of HR metrics with the highest strategic priorities, adaptation of the culture and structure of the HR organization to the influence of the external environment. Thus, this approach is unique in that it combines digital transformation with a deep value-cultural change owing to integral vectors and the Tereshchenko Model. This creates not only technical but also human, behavioural, and semantic prerequisites for success, which is especially important in the context of VUKA, post conflict rehabilitation, or small farming structures. The proposed model does not compete with classical tools—it complements them, especially where transformation through people,

culture and structures is needed, rather than just measuring performance. In cases where it is necessary to deeply rebuild the system to address external challenges, this model will be significantly more effective than the BSC or Canvas. However, for operational management or routine control, it is better to combine it with classical metrics.

The study emphasized that an integrated approach allows for a comprehensive assessment of the effectiveness of a business model, taking into account not only individual indicators but also the systemic interaction of key factors, such as resource productivity, profitability and financial stability. This approach has several advantages in the context of the digital transformation of the HR strategy, including identifying "bottlenecks", modelling a digital analogue, and improving the quality of management decisions.

Therefore, building an innovative business model based on a cluster approach, which will allow for maximum involvement of all stakeholders in the development of agricultural entrepreneurship, is promising.

6. Conclusions. A methodological approach is proposed to identify the need to update the business model of the enterprise on the basis of the integral efficiency vector: resource utilization productivity, model profitability and financial stability. A mathematical apparatus for calculations and options for interpreting the results has been developed. This approach allows for a rapid assessment of the need to improve innovative business processes and HR strategies. The example of "Semenivsky Agroservice" LLC highlights the need to modernize production processes via precision agriculture technologies. A new model of the enterprise's business processes has been built, focused on digitalization, identifying weaknesses and increasing management efficiency. Considering the current state of digitalization and the resource potential of the enterprise, directions for improving the HR strategy of "Semenivsky Agroservice" LLC include forecasting and personnel planning via artificial intelligence technologies; digital recruitment (chat bots, online surveys, digital platforms); and the implementation of HRM systems to automate HR functions. These steps are aimed at adapting human capital to new business operating conditions and supporting the implementation of the updated business model.

The conducted research allows us to formulate a number of recommendations for different target audiences: HR specialists, managers of agricultural enterprises, developers of digital solutions and public authorities. When formulating recommendations, HR specialists of agricultural enterprises should consider the following: implementing integrated approaches to assess HR efficiency, focusing on the digital maturity and flexibility of personnel processes; actively using HR analytics (people analytics), e-learning, and adaptive recruiting tools, particularly in conditions of instability and labour mobility; and focusing on the principles of HR design thinking to create employee-oriented solutions in crisis conditions. Managers of agricultural enterprises should focus on integrating the HR strategy into the overall business model of the company as a key driver of digital transformation and operational flexibility; use strategic HR management tools (balanced scorecard, workforce planning) to achieve consistency between human capital and business goals; and ensure that investments in digital HR platforms are an element of long-term competitiveness. Developers of digital solutions (HR-tech) need to focus on the real needs of the agricultural sector in conditions of limited resources and an unstable environment; offer scalable, cloud-based, adaptive solutions, with the ability to integrate with state systems and ERP; and provide user language support and adaptation of interfaces to field and remote conditions. State bodies and organizations for the digital transformation of the agricultural sector need to constantly provide institutional support for the implementation of digital HR solutions at the level of medium and small agricultural enterprises. Prospects for further scientific research include conducting a comparative analysis of HR strategies in different regions of Ukraine and types of agricultural enterprises (small, medium, and large).

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Data Availability Statement: Data of key indicators of economic activity of "Semenivskyi Agroservice" LLC 2020–2023.

Informed Consent Statement: Informed consent was obtained from all the subjects involved in the study.

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Трансформація інноваційно-орієнтованої HR-стратегії та реінжиніринг бізнес-моделі: емпіричні висновки з українського агробізнесу

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Ця стаття узагальнює аргументи та контраргументи в межах наукової дискусії з питань напрямів трансформації інноваційно-орієнтованої HR-стратегії та здійснення реінжинірингу бізнес-моделі аграрних підприємств України в умовах зростання цифрової економіки. У цьому контексті особливого значення набуває застосування інтегральної парадигми стратегування та використання моделі Терещенко, яка дозволяє поєднати цифрові, ціннісні та поведінкові вектори розвитку підприємства в єдину HR-бізнесову архітектуру. Методичним інструментарієм проведеного дослідження став факторний аналіз оцінки необхідності оптимізації бізнес-процесів за такими групами показників: інтегральний вектор продуктивності ресурсів підприємства (земля, праця, засоби виробництва), що відображає ефективність використання ресурсів сільськогосподарських підприємств; інтегрований вектор прибутковості бізнес-процесів; інтегрований фінансовий вектор і вектор ефективності бізнес-моделі. Запропонована система інтегральних показників дозволяє забезпечити комплексну оцінку системної ефективності аграрного підприємства з урахуванням не лише операційних результатів, а й стратегічних, організаційних та культурних аспектів його функціонування. Сформована методологія є мета-аналітичним каркасом, що забезпечує синергетичне поєднання HR-стратегії, ресурсного менеджменту та інноваційного розвитку підприємства. Визначено, що перевагою використання моделі Терещенко в агробізнесі України у контексті трансформації інноваційно-орієнтованої HR-стратегії полягає в її здатності системно поєднувати бізнес-модель, культуру, ресурси та поведінкову динаміку працівників. Це особливо актуально в умовах постконфліктного відновлення, цифрової трансформації та демографічного виклику, з якими стикається український агросектор. Результати проведеного дослідження дозволяють удосконалити кадрову стратегії сільськогосподарських підприємств шляхом прогнозування та планування трудових ресурсів з використанням технологій штучного інтелекту; цифровий рекрутинг (чат-боти, онлайн-опитування, цифрові платформи); впровадження HRM-систем для автоматизації кадрових функцій. Ці кроки спрямовані на адаптацію людського капіталу до нових умов ведення бізнесу та підтримку впровадження оновленої бізнес-моделі.

Ключові слова: HR-стратегія, оптимізація, інноваційна бізнес-модель, сільське господарство, кластер, факторний аналіз, інтегровані вектори, цифрова економіка.

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