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Digital Ecosystem Model of Labour Resources Management in Economic Militarism

Modelo de ecosistema digital de gestión de recursos laborales en el militarismo económico

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Autores

Viktor Koval[1], Oleg Kaminskyi[2], Vira Brednyova[3] y Ludmila Kosharska[4]

Resumen:

Este artículo tiene como propósito estudiar la gestión de recursos humanos en condiciones de incertidumbre, debido a las acciones militares actuales, en el mercado laboral de Ucrania, con el fin de desarrollar un modelo de plataforma en línea de recursos laborales para el gobierno de Ucrania, considerando el desarrollo de las tendencias del concepto *"Human Cloud"*. En las actuales condiciones bélicas del país, la incertidumbre en el desarrollo de los sectores económicos (construcción, arquitectura, industria marítima, puertos, construcción naval, producción agrícola) y el fortalecimiento de la influencia de los factores negativos del entorno externo e interno sobre los recursos laborales, los peligros y amenazas en la gestión del sistema, son cada vez mayores, afectando negativamente la calidad de la toma de decisiones y la ejecución de proyectos.

[1] Doctor of Economics, Professor, National Academy of Sciences of Ukraine. Kyiv, Ukraine. Email: victor-koval@ukr.net, https://orcid.org/0000-0003-2562-4373

[2] Doctor of Economics, Department of Computer Mathematics and Information Security, Kyiv National Economic University named after Vadym Hetman. Kyiv, Ukraine. Email: olkam@kneu.edu.ua, https://orcid.org/0000-0003-0607-8944

[3] Ph.D., Professor, Odessa State Academy of Civil Engineering and Architecture. Odessa, Ukraine. Email: vera2008@ukr.net, https://orcid.org/0000-0002-3005-2384

[4] Ph.D., Professor, Odessa National Maritime University. Odessa, Ukraine. Email: kosharska@gmail.com

Para prevenir estos retrocesos en el contexto de una economía militar, se propone aplicar los principios del concepto de *"Human Cloud"*, en base a sus ventajas para lograr un equilibrio entre asegurar la capacidad de defensa del país y la estabilización económica. Para ello se propone un modelo de plataforma en línea basada en un enfoque ecosistémico. La construcción de plataformas en línea se basa en un modelo agregador (Aggregator Business Model) que no requiere coordinación y proporciona infraestructura para proyectos que consiste en una gran cantidad de microtareas. Se ha comprobado que en el contexto de las operaciones militares es necesario desarrollar tecnologías digitales transformadoras, reformar los procesos institucionales y conectar la fuerza laboral en una sola "nube" para realizar tareas en entornos operativos cada vez más complejos.

Palabras clave: recursos laborales, transformación digital, modelo de ecosistema empresarial, administración, plataforma digital

Abstract:

The purpose of the article is to study the management of human resources in conditions of uncertainty in the labor market of Ukraine due to military actions, to develop a model of an online platform for labour resources for the government of Ukraine, taking into account the development trends of the "Human Cloud" concept. In the conditions of military operations, uncertainty in the state of development of economic sectors (construction, architecture, maritime industry, ports, shipbuilding, agricultural production) and the strengthening of the influence of negative factors of the external and internal environment on labour resources, the dangers and threats in the system of their management are increasing, which negatively affect the quality of decision-making and implementation of projects. To prevent these processes in the military economy, it is proposed to apply the principles of the "Human Cloud" concept, based on its advantages in achieving a balance between ensuring the country's defense capability and economic stabilization, and an online platform model is proposed for its provision based on an ecosystem approach. The construction of online platforms is based on an aggregator model that does not require coordination and provides infrastructure for projects consisting of a large number of micro-tasks. It has been proven that in the context of

military operations, it is necessary to develop transformative digital technologies, reform institutional processes, and unite the workforce in a single "cloud" to perform tasks in increasingly complex operational environments.

Keywords: labour resources, digital transformation, business ecosystem model, management, digital platform

1. Introduction

Human resources management is one of the most important factors affecting the adaptation and development of the country's economy during periods of various crises (Bantash et al., 2020). Due to military operations in Ukraine, threats of job losses are increasing, and among the most affected sectors of the economy are the defense sector, the maritime industry, construction, and agriculture, which directly affects state security (Harbar et al., 2020). Employment insecurity has risen since the outbreak of hostilities due to building demolitions, including the destruction of more than 4,000 homes (estimated $13,453 million) and nearly 100 businesses (estimated $2,921 million), eroding job opportunities and creating life risks (Center for Economic Strategy, 2022). During the same time, almost 86% of companies in Ukraine stopped or slowed down their development, of which 48% now work partially or almost do not work (KSE, 2022). The transformation of labour relations is aimed at increasing the opportunities to work (partially) or remotely (online) from 20 to 24%, and almost 40% of Ukrainian citizens have stopped working (Rating Group Ukraine, 2022).

At the same time, the economy of Ukraine underwent a forced sectoral transformation in order to ensure the stability of the functioning of the economy, as a result of which 16% of enterprises were transformed, and up to 20% are in the process of transformation (Center for Economic Strategy, 2022). The greatest decline during the war was experienced by those areas of the economy that ensure the defense capability of the state and require state support, especially in those industries where online work is not possible (trade in food and non-food products, sea transportation, construction and architecture, shipbuilding) (Centre for Economic Strategy, 2022). The deployment of

hostilities forced a significant part of the population to leave their homes, as a result of which up to 25% changed their place of residence within Ukraine, and 20% to 30% of the population of Ukraine went abroad, which led to a shortage of personnel in many enterprises (UNHCR, 2022). In the functioning of the military economy, there is almost no class of small enterprises (i.e., with up to ten employees) that become a source of social tension, including in the informal economy, so the main shortage of personnel will be felt at enterprises of critical infrastructure.

To counteract these trends, the government of Ukraine has implemented six programs of non-refundable grant assistance to support small and medium-sized businesses. These are, in particular, micro-grants for the creation of one's own business; non-refundable grants for the development of processing enterprises (wood processing, construction, construction structures, agrarian processing), grants; and a program within which the state, through a specialized fund, will buy a share from startups.

Warfare actualizes the difficult task of managing labor resources in the interests of public safety and economic stability. In essence, in enterprises, top managers must respond to threats whose extent is unknown, and they make personnel decisions under conditions of limited time and extreme uncertainty. In times of crisis, which includes military operations, uncertainty in the management of economic processes increases due to a number of factors: employment problems, lack or limited amount of finance, limited daily demand for goods, impossibility of long-term planning, lack of security. Taking anticipated threats to personnel policy during militarism into account and the need for a transition to a military economy allows us to draw a conclusion about the relevance of this study.

During the war, the transition of personnel support services to digital technologies had a significant impact on Ukraine's labor market. Those businesses that are part of critical infrastructure, including energy, telecommunications, media, and financial businesses, should be staffed as a top priority, as these industries are often considered prime targets for wartime attacks. The implementation of the specified priority should be carried out by creating and strengthening the capabilities of the national system of online labor resources management platforms based on the principles of the Human Cloud concept. The novelty of this article lies in the fact that it is aimed at the study of the structure of

online platforms for the management of labor resources in a military and post-war environment and the use of neural networks to solve the problems of personnel selection in critical conditions.

2. Literature review

Military operations, population migration, and the consequences of destruction lead to an increase in the pressure of social activity on the economy (Center for Economic Strategy, 2022). In such conditions, managers quite often have to make decisions in conditions that are far from optimal: too little or too much data, as well as a large amount of data with uncertain or variable reliability (Beiro, Patrcio & Fisk, 2017).

Previous research suggests that the effectiveness of decision-making in highly complex and uncertain situations, such as war, largely depends on the ability of groups to successfully acquire, integrate, and process information (Schippers, Edmondson, & West, 2014). In military and post-military conditions, an important indicator of personnel appointments is transparency. Transparency can be seen as both a capability and an outcome. Human resource transparency can be imagined as the ability to present the process of selecting candidates for positions in the digital space, with all relevant data that can be collected, processed and accessed online, supporting the planning and monitoring processes of labor resources.

It is in such periods that the application of the methods of the concept of "Industry 4.0," such as digital transformation in combination with hyperpersonalization (Stewart & Stanford, 2017), will allow the formation of new business models to ensure the income of the population at the expense of digital platforms. However, many businesses will have to reform their business models and move from offline employment to online (O_2O), thus ensuring the emergence of new short-term jobs that will be filled through web and mobile platforms (Beirão, Patrício, Fisk, 2017). With the development of technological achievements within the framework of the concept of "Industry 4.0", companies have actually begun to balance between the archaic model of the full-time workforce and the GIG-economy model. The annual increase in the number of freelancers is steadily increasing, and people are moving to work within this business model (Caminiti, 2018).

The gig economy in developed countries is growing faster than the traditional economy, meaning that more and more workers are choosing to work independently.

As defined by researchers in the work (Healy, Nicholson & Pekarek (2017), online recruitment platforms are proprietary software applications that form a three-way relationship, a new business model in which suppliers and users can exchange goods and services using a digital intermediary. However, the work does not give a clear interpretation of the term "GIG economy." The analysis of literary sources showed that it can be defined as "interaction between several parties (seller, buyer, and online platform)" (Healy, Nicholson, Pekarek, 2017, p. 236), where the platform acts as an intermediary, or aggregator.

In the study (Stewart and Stanford, 2017), the basic characteristics of the gig economy were analyzed, and it was determined that the concept of Human Cloud includes flexible business models based on the selection of employees who have the freedom to choose the place of work, and tasks are performed through online platforms.

SIA (2018) determined that the term "Human Cloud" means a new model of mediation in employment, which allows the execution of various types of work (including payroll transactions) entirely through digital online platforms. In many cases (though not always), such a platform also supports project management (to a lesser or greater extent). Job boards and social networks are not defined by authors like Human Cloud, although such methods of talent exchange can support this model.

The growth in the variety, number, and importance of different types of work arrangements has become a critical factor in how work gets done in (and for) the enterprise. The study (Altman E. & Kiron D., 2022) argues that the best way to conceptualize and account for these shifts and related practices is through the lens of workforce ecosystems. The study defines the "workforce ecosystem" as a structure consisting of interdependent entities within the organization and outside it, working to achieve both individual and collective goals. Triple-bottom-line (TBL) is a concept coined by John Elkington with the aim of searching for a new language to express the expansion of sustainable values in business practices. According to the author, there are three major

aspects of sustainable behavior that create value: economic prosperity, environmental quality, and social justice. The concept has further been developed into a "3P formulation," which consists of "people, planet, and profit" (Elkington, 2004).

3. Methodology

To solve the tasks, the study uses both general scientific and special methods, in particular, a systematic approach for analyzing the digital transformation of the economy during the war, as well as an analysis of the international experience of the development of the concept of Human Cloud. The study uses theoretical-analytical models, methods of economic cybernetics (systemic analysis of the economy, models of business ecosystems), inductive and deductive approaches to the interpretation of research results.

None of the known methods of assessing labor potential investigates the nature of the dependence of integral estimates on a set of individual estimates, simply limiting itself to ascertaining some analytical dependence. At the same time, there is no verification procedure for the proposed analytical models, checking their adequacy for large databases that are formed on the basis of digital platforms (Filipishina, Gonchar, Bohachov, 2020). The method of assessing labor potential based on a neural network approach proposed in this article involves the implementation of the procedure for searching for the best (according to a certain set of criteria) candidates for vacant positions within the hybrid state online platform of labor potential and personnel agencies. The use of an artificial neural network to describe this weakly formalized multifactorial nonlinear dependence ensures that the class of analytical and logical models under consideration is practically unlimited.

In the process of distributing labour resources in Human Cloud, each participant has their own special skills and personal preferences according to the work characteristics of other job applicants. For example, employee attributes can be “S:” "has the skills to use SEO tools," "strong logical thinking," or "teamwork skills." These attributes indicate that a person is well versed in SEO, has good teamwork experience, and thus is well suited for a middle manager position. The attributes required by candidates for the same position

should be similar. Thus, it is possible to build a specific network of human resources based on the attributes of each person.

If "P" job seekers are given and S attributes are set, the human resources network can be formed as:

$$\mathrm{HR} = (\mathrm{T}, \mathrm{R}, \mathrm{L}), \quad (1)$$

where: $T = \{t_1, t_2, \dots t_p\}$is a set of vertices representing P job seekers, and $R = \{r_{ij}\}$is a set of edges connecting two vertices in T, L is a set of vacant positions. If $\mathrm{X} = \{\mathrm{X}_{LA}, X_{UL}\}$ - the requirements for attributes that are specific to the relevant position, where: $\mathrm{X}_{\mathrm{LA}} = \{\mathrm{X}_1, \mathrm{X}_2, \dots \mathrm{X}_{\mathrm{L}}\}$- the set of personnel skills that is specific to $\mathrm{X}_{UL} = \{\mathrm{X}_{\mathrm{L}+1}, \mathrm{X}_{\mathrm{P}}\}$.

The adjacency matrix of the HR human resources network can be built on the basis of the ratio of human resources, which are displayed by an integral symmetric matrix $V = [v_{ij}] \in R_+^{PxP}$. In the case when there are edges between vertices *i* and *j,* then, $v_{ij} = 1$, otherwise $v_{ij} = 0$. For all *and* which are less than or equal to P and which are greater than or equal to unity, we get $v_{ii} = 0$.

Accordingly, we can now introduce a symmetric matrix $M_{ij} = [m_{ij}] \in R_+^{PxP}$, to represent the similarity of labour resources in the dual digital platform data lake, when $v \in R^p$. We get the following equation:

$$M_{ij} = exp\left(-\sum_{e=1}^{P} \frac{(v_{ie} - v_{je})^2}{b_e^2}\right) \quad (2)$$

In equation (2), $\mathrm{v}_{ie}$is the e-th element of the vector $\mathrm{v}_i$of the adjacency matrix V, and the variable b is the value on the scale of the quantitative assessment of the control parameter for each dimension. Accordingly, taking into account the relationship between different employees who are suitable for one and the same position, we introduce the RM staff relationship matrix:

$$\mathrm{RM}_{\mathrm{ij}} = \mathrm{M}_{\mathrm{ij}} - \frac{\sqrt{\mathrm{e}_{\mathrm{i}}^2 + \mathrm{e}_{\mathrm{j}}^2}}{\sum_{\mathrm{ij}} \mathrm{M}_{\mathrm{ij}}}, \quad (3)$$

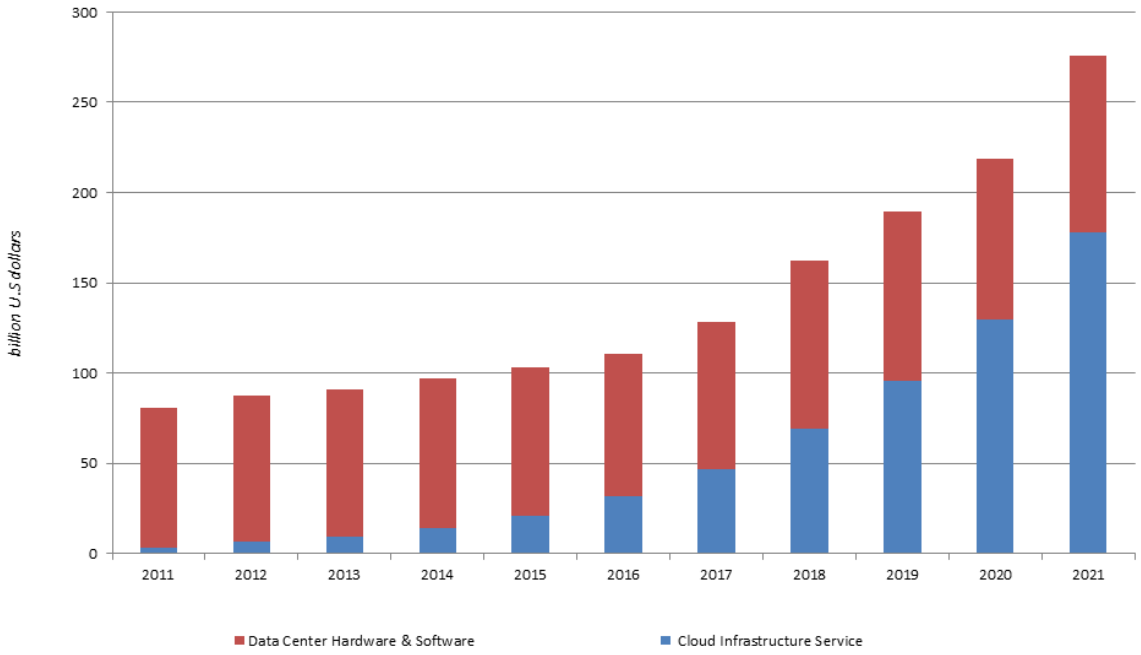
where: RM is a further optimization of the matrix M, which can be used to better reflect the relationships between vacancies and human resources in the platform's data lake, e_i is the degree of correspondence of personnel vacancy *i.* On the basis of the nonlinear characteristics of the network of relations between labour resources in the Human Cloud environment, a neural network model can be built to solve the problem of the allocation of human resources during the war, which will allow to take into account the characteristics of personnel and explore the similarity of personnel with other performance factors in cloud platforms.

4. Results and Discussion

Using the concept of "Human Cloud" provides unique opportunities precisely in conditions of uncertainty in the field of economic relations. First, its application allows avoiding bureaucracy more than the absence of bosses and partnership in horizontal work groups. Ordinary employees get the opportunity to connect to areas of activity where they find new and unique ways of self-realization and the opportunity to bring work interaction to a fundamentally new level. Secondly, Human Cloud is not a single tool or product. It can be defined within the framework of this study as a set of tools and applications that transfer labour relations from the traditional office to the digital space of online recruitment and exchange of services, which provides greater flexibility and security.

Over the past few years, the trend towards remote work of employees (25-30%), driven by the development of digital technologies and the transition to a knowledge-based economy, as well as the sudden outbreak of the global COVID-19 pandemic, has contributed to a change in workforce management and the business model of companies (16 %) (Apollo Technical, 2022). In turn, enterprises began to increase spending on cloud and data centers by segment, mainly for the use of collaboration platforms (Figure 1).

Figure 1. Enterprise spending on cloud and data centers by segment, 2011-2021.



Source: based on Statista (2022).

The modern workforce includes not only employees, but also contractors, freelancers, and service providers (Koval, Polyezhayev, & Bezkhlibna, 2018; Mazur, & Kubai, 2019). It is now a critical issue to establish an effective workforce management system (Prokopenko, Zieba, & Olma, 2016), comprised of internal and external players, in a manner consistent with state strategic goals and wartime conditions. However, old management methods that focus on staffing and use linear methods are not effective. The increasing variety and number of different types of work organizations in such conditions is a critical factor in management organizations. The development of the Human Cloud paradigm, as a multidimensional phenomenon based on digital platforms and distributed networks and connecting people and communities, forces "traditional" organizational systems to update their methods and technologies to remain relevant in complex environments. An integrated approach to managing a non-integrated workforce is losing its relevance.

Hypothesis 1. The best way to conceptualize and determine the trajectories of these changes and related management practices is to analyze them through the lens of an ecosystem approach to workforce management.

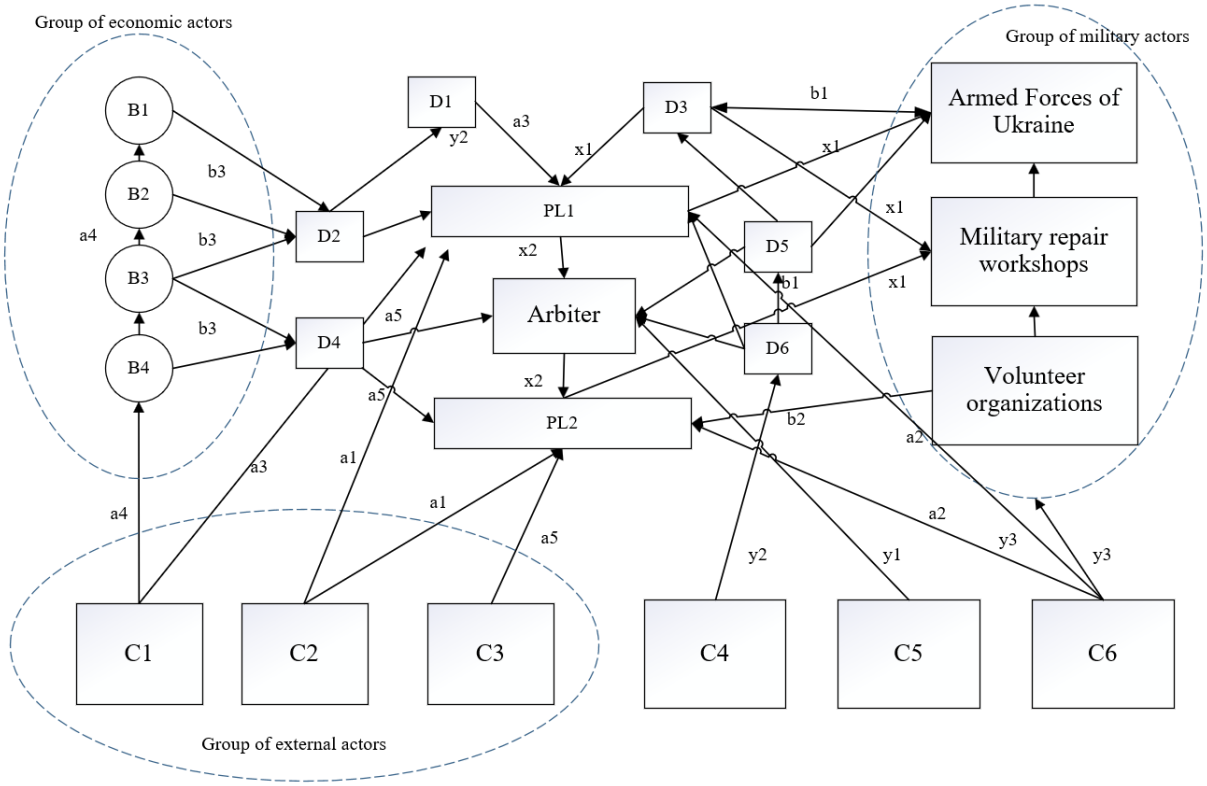
The ecosystem approach is a significant departure from the traditional view of the workforce, which envisions individual employees performing work along linear career paths to create value for their organization. This new approach treats the workforce ecosystem itself as a structure. Managing employees and managing a workforce ecosystem are fundamentally different processes.

Within the framework of this study, we can define a workforce ecosystem as a structure (a network of companies, institutions, and customers) that consists of interdependent participants, both within organizations and outside of them, who work to achieve both individual and collective goals. The ecosystem approach is supported by a technological infrastructure that allows businesses to order work in various forms and hire specialists with end-to-end online support.

A modified model of the business ecosystem of human resource management in Ukraine in a war based on the Human Cloud, built on the basis of the characteristics described in (Altman & Kiron, 2022) is shown in Figure 2.

The following actors are defined in the model : B1 – food producers; B2 – suppliers of fuel and energy; B3 – IT enterprises; B4 – suppliers of building materials; PL1 – military digital platform; PL2 – digital platform of labour resources; D1 – social networks of military specialists; D2 - non- employed contractors, freelancers ; D3 – online platforms of defense industry enterprises ; D4 - online personnel platforms (databases where organizations store talents they have discovered or worked with previously); D5 – developers of digital products; D6 - cloud service providers. C1 – legislative bodies that establish the legal framework in the field of defense; C2 – educational institutions and research organizations; C3 – independent management systems (recruitment agencies); C4 – software manufacturers (digital platforms); C5 - Internet service provider companies, C6 - developers and suppliers of cyber protection systems.

Figure 2. Model of the business ecosystem of labour resources management in war conditions (based on Human Cloud).



Source: authors' own elaboration.

The following processes and flows are defined in the model: a1 – personnel training, a2 – platform support, a3 – provision of consultations, a4 – legislative support and regulations, a5 – provision of personnel databases, x1 – selection of specialists for vacancies, x2 – integration of services, y1 - provision of cloud services, y2 - supply of software for platforms, y3 - supply of cyber security systems, b1 - recruitment of personnel for temporary work, b2 - selection according to individual characteristics, b3 - insurance, social security, incentives and bonuses.

The model shows the need to select a key actor, who can be conventionally called an arbiter—an actor who oversees and directs the activities of other actors (parts of the ecosystem), constantly monitors the need to include new information resources in order

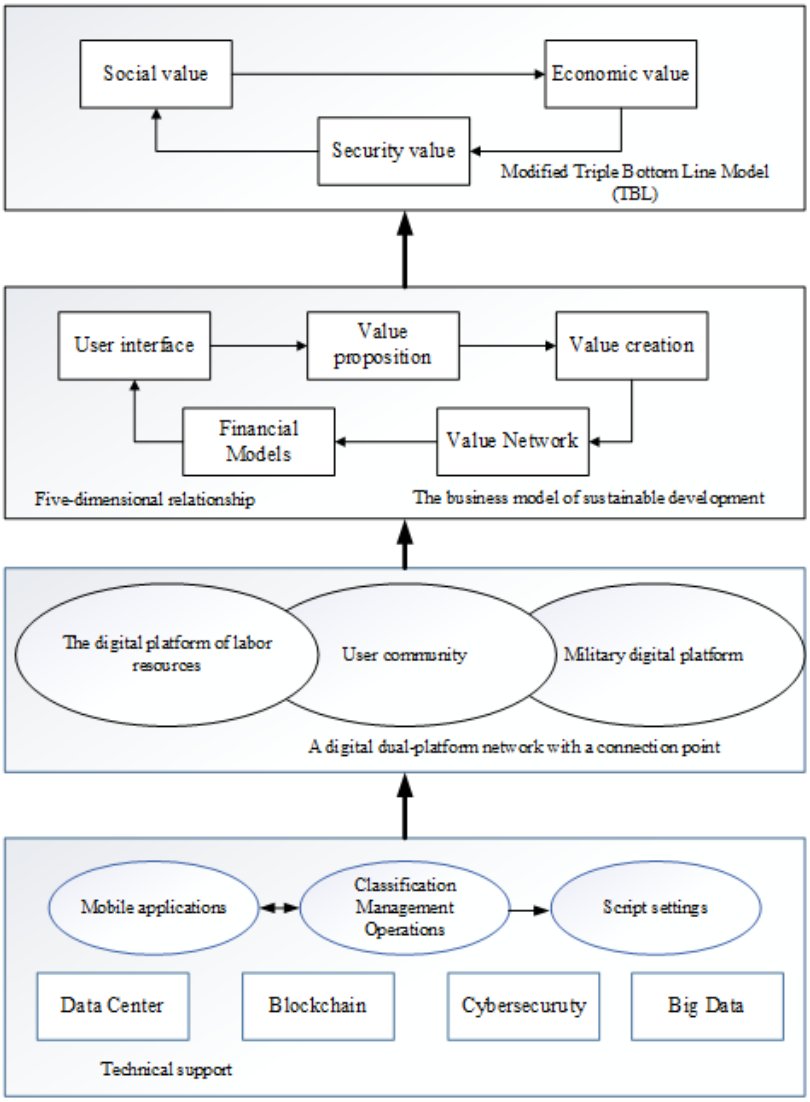
to maximize the integration of both digital platforms, determines the exchange of information between them, and conducts monitoring of cyber protection.

The proposed ecosystem model of manpower management for the defense of the country in conditions of war based on two digital platforms solves several limitations of other models. First, the role of the key actor (arbitrator) is defined in the model; and secondly, the model was developed to take into account the role of volunteer organizations in the supply of equipment to the army and the distributed organization of the army of a new type. Therefore, a category of actors with environmental roles was added to the model to integrate state and security roles affecting the ecosystem.

Hypothesis 2. Human Cloud in the conditions of the military economy must be built on the basis of a two online platform structure (labour resource management platform, and military platform). The government has several different ways to take advantage of the Human Cloud. The first and most direct are online platforms like “Upwork”, which allow to browse and recruit freelancers as needed. In the Kaganer et al. study (2013) systematized four categories of business models for building digital Human Cloud platforms, in particular the " facilitator" model (transparent access to information, portfolio, history of documents confirming abilities, and virtual dashboards for project management). The "aggregator" model is a solution for simple repetitive work that does not require coordination and where projects consist of a large number of micro-tasks that can be delegated to many suppliers. The third model, the "arbitrator" model, represents solutions for highly unstructured, difficult-to-evaluate jobs that require specialized expertise and training, and the quality of their outcomes must be evaluated against multiple alternatives. "Arbiters" provide access to a community of skilled workers who can be recruited through tenders. The fourth and last model is the "manager" model, which requires a high level of management and coordination and is intended for freelancers who offer premium services and where the platform takes responsibility for every risk associated with the project. Taking into account the results of the business ecosystem model for the management of labour resources in conditions of war (based on Human Cloud) and the conditions of data uncertainty during the war, as well as the high level of information noise in the data for analysis, it is proposed to use the "arbitrator" model to

build a two-online platform. This model will also ensure a high level of cyber protection. To combine the two online platforms and the arbitrator business model, a four-level integrated framework is proposed (Figure 3), which includes the two online platform network, the work assurance mechanism, the sustainable development business model, and the modified triple bottom line (TBL) model. Based upon the concept of the triple bottom line (TBL), a revised model has been suggested to delineate the domains of sustainable economics.

Figure 3. A model of an online platform structure for the management of labour resources in conditions of military economy.



Source: authors' own elaboration.

The domains suggested are economic, social, and security. It is worth mentioning that equal weight has to be given to all three domains in order to be regarded as true sustainable economics. The model can use cloud data centers, blockchain, and big data for the provisioning layer of the platform, providing a full range of software and hardware solutions through the platform network (Kaminsky et al., 2021). The two online platform networks are used to identify, manage, and run data discovery and analysis scenarios; categorize data; and integrate data.

The second level of the model is supported by three platforms: a social user network, a labour resource management platform, and a military platform. Among them, the social network of users works as a contact point for users; the military platform allows you to quickly ensure the implementation of military projects; and the labour resources platform collects more specialists and resources. At the third level, we see the connection between the network of digital platforms and the business model of sustainable development (Laktionova et al., 2022). The platform becomes a gateway for communication between users and enterprises, which changes the dimension of the client interface.

The military platform provides personalized services using data mining techniques and consists of separate distributed modules connected through the platform network, with the ability to receive data from other industries such as food, clothing manufacturing, and construction material supply.

The fourth level shows a wartime modification of the well-known triple bottom line model, which aims to evaluate financial, social, and security indicators with the goal of not only making a profit, but also providing a security component.

Features of the functions of managing the search and selection of specialists based on this model are shown in Table 1. Given the nonlinear characteristics of the network of labour relations in the cloud data lake (formula 1), to solve the problem of managing the distribution of human resources, it is proposed to use a software model for building neural networks using the autoencoder component module (Velickovic, 2017).

Autoencoders are a variant of building neural networks with direct communication, where the input signal coincides with the output. They compress the input data into a lower-

dimensional code and then reconstruct the output data from that set. Models of this class are common in industries involving a large number of observations and/or a large number of variables.

Table 1. Functions of management of labour resources in conditions of war and their features for the dual online platform

Functions	Permanent employment	Freelance - workers
Cooperation	✓ digital collabour ation; ✓ brainstorming	✓ collabour ation in the cloud; ✓ formal and informal communication; ✓ communication networks; ✓ networking
Performance management	✓ definition of business goals; ✓ KPI control; ✓ Feedback	✓ distributed tasks; ✓ monitoring performance metrics; ✓ normalization
Learning and development	✓ centralized repository of educational materials; ✓ individual study schedule	✓ online learning; ✓ video courses
Awards and recognition	✓ board of military achievements; ✓ social recognition	✓ feedback on the work done; ✓ awards
Creating a pool of qualified specialists	✓ specific projects; ✓ career plan ✓ leadership	✓ limitless career; ✓ providing global opportunities
Creation of state corporate culture	✓ mass political and social activism	✓ open system approach; ✓ digital inclusion

Source: authors' own elaboration.

In the input data set S of the autoencoder is the personnel relations matrix *RM* from equation 3. The encoded matrix *RM* will be transformed into a low-dimensional mathematical embedding $L = [l_{ij}] \in R^{d \times P,}$ where $d < P$. Thus, we can obtain the following equations:

$$l_i = f(M_l rm_i + d_l) \quad (4)$$

where: M_l – the weight of the coding layer and the shift vector ($M_l \in R^{d \times P}, d_l \in R^{dx1}$); *f ()* is a normalized exponential function. This function accepts input data in the form of a vector and normalizes it as a probability distribution, which in turn consists of the probabilities of the input vector proportional to exponentials. After decoding, the image of the hidden layer *L* is displayed in the space of the derived data to obtain its reconstruction.

$$k_i = f(M_k rm_i + d_k) \quad (5)$$

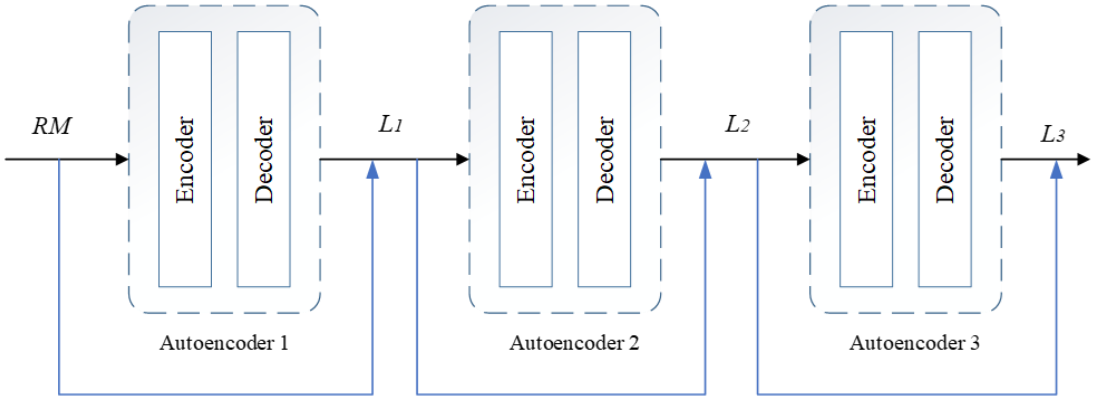
where: M_k - the weight of the decoding layer and the shift vector ($M_k \in R^{P \times d}, d_l \in R^{Px1}$).

The autoencoder is assigned to the main one to study the state of the parameter $\{M_l, d_l, M_k, d_k\}$, which will restore the derived data, to minimize the raw data, and also restore the deviations between the data, which will allow to obtain *L.* In addition, a sparsity constraint is added to *L* by imposing constraints on the neural network. We can also obtain the cost function *V* for a neural network with an autoencoder, which will allow us to see the deviation between the forecast results and the real state:

$$V = \arg\min \sum_{i=1}^{n} (rm_i - k_i)^2 \quad (6)$$

A multilayer neural network consisting of autoencoders at each level is created to solve the task of labour resource planning in a cloud data lake. Each layer's input is taken from the previous layer's output, and each layer uses greedy algorithms, an approach that only trains one layer. As shown in Figure 4, the network uses three autoencoder stacks. For a neural network with an autoencoder, we train the first autoencoder by reconstructing the raw data in the *RM matrix* and obtaining a representation of the hidden layer $L_{1.}$ Then *L1* acts as an input for the next autoencoder.

Figure 4. A neural network model with three stacks of autoencoders



Source: authors' own elaboration.

Assuming that person *i* and person *j* are suitable for the same job, they should have some similar attributes that are used as input for workforce planning. At the exit, the network will provide recommendations for job applicants. The network will continuously learn to effectively implement the process of matching applicants and positions.

Thus, a human resource management model based on a deep learning neural network for the analysis of Human Cloud and a digital platform will be able to ensure a higher level of compliance of specialists to the positions held in the country's defense system in conditions of military economy.

5. Conclusions

With the development of the latest IT technologies and based on modern business models, there is a digital transformation in the field of employment. In a military environment, traditional management models must adapt to the needs of the market. Accordingly, managers are looking for new ways to engage workers, and workers in such conditions feel more comfortable thanks to the digitalization of work. The impact of digital transformation on the creative supply chain is making more transactional data available, better search algorithms, and faster hiring decisions. All this will contribute to the growth of the Human Cloud and GiG technology economy in the future, further expanding B2B applications, cloud platforms to meet the new demands of the global market.

The study considers some aspects of labor resource management in war conditions, such as achieving a balance between ensuring the country's defense capability and economic stabilization, and analyzes the business ecosystem of labor resource management for the military economy of Ukraine. The use of Human Cloud principles in such an ecosystem is analyzed. The structure of a double online platform for the workforce ecosystem of Ukraine is proposed, which is based on an arbitrator model that does not require coordination and provides an infrastructure for managing complex projects consisting of a large number of unstructured tasks as well as a neural network model for recruitment.

Further work provides for the study of the application of the neural network model for the recruitment process in projects for the distribution of military resources, taking into account the fact that the effectiveness of the personnel will directly affect the efficiency of the project and ensure its security.

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