

ORIGINAL RESEARCH PAPER

The social responsibility of dual education in an unstable environment

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ABSTRACT

**BACKGROUND AND OBJECTIVES:** In a context of instability caused by various crises, including military crises, the higher education system is at great risk. Practice-oriented (dual) education is one of the most effective ways to address this problem. The innovation of this study is that for the first time a theoretical and practical model for involving all stakeholders in this process has been created and tested. The aim of the article is to substantiate a socially responsible dual education system in an unstable environment.

**METHODS:** In terms of objective, this is an applied and quantitative study. The study population is estimated at 13 universities, 10 companies, 50 students between November 2021 and November 2022. The sample size is estimated using the Cochran formula. A standard 5-point Likert scale questionnaire was used to collect data, where groups of questions corresponded to 4 hypotheses. All data were investigated by factor and cluster analysis using STATISTICA software (version 10.0).

**FINDINGS:** All four hypotheses were confirmed. Before the war, the first and second hypotheses were prioritized. According to them, the process approach of social responsibility of dual education allows designing and launching a system of social responsibility of dual education and creating a talent pool at the employing enterprise. After the outbreak of hostilities, the priorities changed. The third and fourth hypotheses allow, through the organization of supportive (enabling) processes, to ensure the effective functioning of the system. As a result, the majority of stakeholders (31%) consider it necessary to modernize the mentoring system and provide graduates with relevant professional skills, while methodological and career guidance came in second and third (16% and 13% respectively).

**CONCLUSION:** Using the theoretical and practical model of formation and implementation of dual education in the unstable conditions of Ukraine will help to solve the problems of the country out of crisis, post-war recovery of higher education system, to bring the requirements of production with the possibilities of training specialists in universities and can be applied in

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## INTRODUCTION

Social responsibility of dual education of any country is one of the main factors to ensure stability of the country's economy, its competitiveness in the global dimension. Some researchers (Ante and Ken, 2014) suggest that it is the interactive interaction and collaboration between business and the education system that allows all available opportunities for technological, economic, social well-being in any country to be exploited. The same thesis is supported by (Hąbek and Wolniak, 2016) that any crisis processes (military actions, natural disasters, economic downturns) have a negative impact and reduce the options for cooperation between business and education. Most developing countries, including Ukraine, have great potential and historical experience of such cooperation. Most researchers in these countries believe that (Shcherbak et al., 2019) the education system has a high level of development, creativity, motivation for self-development and actualization of skills, including digital skills. All of these skills are particularly in high demand in today's environment. On 24 February 2022, Russia unleashed a war, which was the starting point for changing the main characteristics of social responsibility in Ukraine, including education. The unstable situation in Ukraine reduces opportunities for education, including dual education. This is confirmed by an analytical report by the International Organization for Migration (IMO, 2022), which systematized Ukraine's losses as a result of Russian aggression from 2014 to May 2022. These include: forced internal and external migration, forced deportation of the Ukrainian population to Russia, doom of civilians and military casualties. According to this report, the total number of displaced persons was 13.7 million, of whom 5.7 million left Ukraine (IMO, 2022). The Minister of Education and Science estimates that 2.5 million school age children and students and 22,000 teachers have left the country (OHCHR, 2022), representing about 40% of students and pupils. This supports research (Beaudoin, 2016; Beerkens et al., 2011) that indirect losses include lost profits for businesses, unpaid salaries for employees, destroyed infrastructure, including educational facilities, and the inability to obtain full educational services. Consequently, such losses together directly reduce the possibility of using dual education to develop not only the practical skills of students, but also the business itself. Accordingly,

this study investigates the impact of dual education on the level of development of social responsibility of higher education in an unstable environment caused by martial law. It can be said that so far no research has been conducted in this field in Ukraine, so this study is innovative. Previous research has shown that the social responsibility of dual education as an effective factor has been linked to innovative changes in higher education under martial law. The following research hypotheses were developed by examining the effective interaction of both main structures, i.e. higher vocational education and enterprises:

Main hypothesis:

The use of dual education increases the social responsibility of educational institutions and enterprises under martial law-induced instability.

*Hypothesis 1:* The process approach of social responsibility of dual education is a sequential implementation of 4 main interrelated components.

*Hypothesis 2:* The first component (Design and development of dual education programmes) and the second component (Implementation of the basic dual education programme) allow to design and launch a system of social responsibility of dual education.

*Hypothesis 3:* The third component (Organization of supporting (enabling) processes) ensures the process of functioning of the dual education social responsibility system.

*Hypothesis 4:* The fourth component (Measuring and controlling the effectiveness of dual education) allows evaluating and monitoring the achieved level of social responsibility of dual education.

### *Theoretical Foundation*

It should be noted that dual education is widely used in almost all countries (Cedefop, 2015). Dual training is a type of training in which the theoretical part of the training takes place in an educational organization, while the practical part takes place in the workplace (Baumann-Pauly et al., 2013). Enterprises place an order with educational institutions for a specific number of specialists, employers take part in drawing up the curriculum (Juanatey et al., 2021). Students undertake on-the-job training in the enterprise (Urbanek, 2020). In the dual system of education the role of the employer intensifies and qualitatively changes (Selcuk, 2019). Beaudoin, 2016; Beerkens et al., 2011 consider that the most important component of dual training is having

trained staff who act as mentors. Most researchers (Beaudoin, 2016; Beerkens *et al.*, 2011; Boer *et al.*, 2011; Campbell, 2018) believe that Germany is a pioneer of dual education. Its experience serves as a model for the entire European Union (Baethge and Wolter, 2015). Göhringer, 2002 believes that the German vocational education system is characterized by a well-developed mentoring institution, practice-oriented training and the active involvement of business in training. This researcher defines dual education in Germany as a strict legislative framework and is implemented with the help of the chambers of industry, commerce and crafts. In all progressive countries where dual education is used, great attention is paid to social responsibility not only of business processes, but also of trainee training (Beaudoin, 2016; Beerkens *et al.*, 2011). Considering social responsibility (SR) as a theoretical concept, it is only possible to define the boundaries of a company's responsibility for its impact on society and the environment (Islam *et al.*, 2021). But to implement a socially responsible business strategy in practice, it is necessary to build processes for managing social responsibility and integrating it into core business processes: production, sales management, logistics, HR management, etc. (Kuratko, 2005).

#### *Rationale for the main hypothesis*

The researchers' point of view (Geel and Backes-Gellner, 2012) is supported by the main hypothesis proposed. This will ensure systematic engagement with key stakeholders, planning, implementation and monitoring of social programmes, as well as evaluating the effectiveness of social investments by business. This requires approaching social responsibility as a special business process integrated into the business practices at all its levels and ensuring its functioning (Javernick-Will, 2012). First of all, this work should be carried out in relation to those activities where key business stakeholders are involved (Kabir and Thai, 2017). Research into social responsibility practices confirms that one of the most relevant areas of business social policy implementation is the management of human resources - both internal (personnel) and external (local community), which have a significant impact on the achievement of business goal (Khosro and Gaye, 2009). Along with medical care, social security and the formation of a comfortable social infrastructure, companies are

actively involved in the development of education as one of the areas of social investment as part of their social responsibility strategy (Kocsis and Pusztai, 2021). The integration of the different perspectives of scholars confirms that the basic hypothesis of using dual education increases the social responsibility of educational institutions and enterprises under conditions of instability.

#### *Theoretical justification for the first hypothesis*

Before the start of hostilities in 2022, the most demanded area for large Ukrainian industrial companies was the support of vocational education sector in close cooperation with public authorities and state educational organizations. The research interest of the authors of the article is conditioned by the prospects of practical application of management approach to the process of formation of production personnel training programmes on the basis of socially responsible dual education model in order to reduce personnel risks in post-war period (Boer *et al.*, 2011). Due to the acute shortage of young qualified personnel in enterprises and the labour market, which emerged against the background of the consequences of the demographic crisis in the 1990s, there is now a serious competition for labour resources (Stevens and Shibanova, 2021). This workforce has to meet the requirements of modern industry (Strike *et al.*, 2006). That is, we are talking about training young professional workers who are physically and intellectually capable enough to operate modern high-tech equipment, who are career-oriented and involved in the employer's corporate culture (Chennamaneni *et al.*, 2012). The existing state system of secondary vocational education is unable to train such professionals without the support of business. With the support of the Ministry of Education and Science of Ukraine (MES), already in 2014, 13 pilot projects were organized to introduce elements of dual education in higher education institutions and a roadmap for the introduction of dual education in Ukraine was developed. The higher education institutions involved in the experiment are: Lugansk National Agrarian University, Lviv Polytechnic National University, Kharkiv National Beketov University of Municipal Economy, Kyiv National University of Construction and Architecture, National Technical University of Ukraine Kyiv Igor Sikorsky Polytechnic Institute, Odessa State

Academy of Construction and Architecture, Odessa National Polytechnic University, National Forestry University National University Of Economics And Finance, Faculty Of Mechanics And Optics, M.E. Zhukovskiy Kharkiv Aviation Institute, Kharkiv State University of Food and Trade, National University of Water Economy and Environmental Management, National Transport University. The project was to last until 2023. However, with the outbreak of hostilities in Ukraine, the social responsibility of professional practice-oriented education has significantly decreased, which reduces the opportunities for businesses to train high-quality personnel for their business processes. Studies of the specifics of the Ukrainian model of social responsibility point to the predominance of personnel support, social protection and development programmed in the total number of socially responsible practices of domestic companies. Under wartime conditions, the focus of internal social responsibility has the dynamics of reducing the social expenditures of enterprises and training and development programmes. Integration of different views of scholars confirms that the first hypothesis of the need for a process-based approach to social responsibility of dual education takes place. Such a process approach can represent a consistent implementation of the main interrelated components.

#### *Theoretical justification for the second hypothesis*

Before the war, the main trend of Ukrainian enterprises was to increase labour productivity through the introduction of new technologies, automation of production processes, and optimization of the number of personnel. These factors determined a significant increase in requirements to the level of competences and qualifications of workers and specialists (Huerta et al., 2012). Therefore, the HR policy of large industrial companies was reoriented from internal charity in favour of personnel (provision of gratuitous services and compensation packages) to social investments in training and development of working and potential employees, primarily young people studying and re-employed at the enterprise (Powell et al., 2016). The prevailing socio-economic context of state-business interaction requires industrial companies in wartime conditions to build new long-term engagement strategies (Chin et al., 2015). These strategies should

be focused on reproduction of human resources for their production facilities, social investments in the system of professional dual education through implementation of joint partnership programmes with educational organizations (Donald et al., 2018). The use of dual education as a form of vocational education allows the practical part of the training to be carried out on the workplace and the theoretical part on the basis of the educational organization (Donia et al., 2016). The system of dual education implies joint financing of workplace-specific training programmes by commercial enterprises interested in qualified personnel and regional authorities interested in economic development and improvement of living standards in the region (Gangi et al., 2018). Integration of different points of view of scholars confirms that the second hypothesis of the need to design, develop and implement dual education programmes will allow organizing a system of social responsibility of dual education. Such programmes will allow organizing effective interaction between educational institution and business in unstable military conditions.

#### *A theoretical justification for the third hypothesis*

The management of the area of training young qualified personnel for modern high-tech production falls within the area of social responsibility and social investments of business and requires a professional managerial approach (Groza et al., 2011). Based on the goals of social responsibility management, i.e. system management of the social responsibility policy integrated into the company's activities, business is faced with the tasks of planning, organizing, motivating, coordinating and controlling the activities of personnel directly interacting with stakeholders on behalf of the company (Chuang, 2004). This interaction takes place at different levels, with different frequency and effectiveness. In order to manage effectively, management must systematically capture, analyze and respond appropriately to signals from the external and internal environment of the organization (Šajeva, 2014). Integration of studies by different scholars leads to the conclusion that it is the organization of supportive (enabling) processes that ensures the functioning of the social responsibility system of dual education.

#### *Theoretical justification for the fourth hypothesis*

The organization manages its social responsibility

and is able to draw conclusions about its achievements and mistakes, plan its activities for the future and build a strategy for sustainable development. All modern management models are to some extent based on the process approach to company management. This approach is expressed in the representation of company activities in the form of a cycle of management actions for planning, plan implementation, control and correction of deviations - the so-called "Schuchart-Deming cycle" or the management process algorithm "PDCA". The process approach is recognized as the fundamental basis for modern management approaches, on the basis of which such management systems as Total Quality Management system (TQM), Process Integrated Quality System (PIQS) integrated with business processes; ISO series standards for management systems; Business Process Management System (BPMS); Enterprise Resource Planning (ERP) - Comprehensive Resource Planning and Management System. International standards in the field of social responsibility such as "AA1000SES Standard for Quality Management of Stakeholder Engagement" and "IQNet SR10 - Social Responsibility Management Systems. Requirements", based on the principles of ISO 26000 and the methodology of ISO 9000 series of standards, also contain a PDCA algorithm that ensures continuous improvement of a company's social responsibility activities through planning, implementation and execution of social responsibility tasks, performance review and evaluation, and results analysis by the management (Hong *et al.*, 2011). The above-mentioned process approach to social responsibility management can be decomposed into separate markets, processes of production of various products and services, processes of management of separate spheres, including staff training on the basis of dual education (Hansen *et al.*, 2011). Thus, in the process of forming a social responsibility management system, the company's activities are 'assembled' and institutionalized in accordance with legislation and international requirements for social responsibility of the company, taking into account stakeholder expectations. The international standard ISO 26000 (clause 3.3.4) indicates the necessity to integrate social responsibility into all aspects of the organization's activity: "Since social responsibility concerns the potential and existing impact of the organization's decisions and activities, the main

focus should be placed on the behaviour within the regular, day-to-day activities of the organization. Social responsibility should be included as an integral part of the company's core strategy, with some accountability at all relevant levels of the organization (Di Paolo and Matano, 2016). It should be reflected in decision-making and taken into account in the implementation of activities". This shows how these requirements can be met and the principles and methods of social responsibility can be incorporated into the field of activity of companies that have joined the dual education system. This framework serves as a basis for building a modern and effective management model that contributes to achieving the business objectives of HR management and increasing stakeholder satisfaction (Campbell, 2018). The analysis of existing theoretical approaches to existing methods for measuring and monitoring the effectiveness of dual education confirms the fourth hypothesis and allows the assessment and monitoring of the achieved level of social responsibility of dual education. The present study and the conceptual model were developed on the basis of academic sources and previous studies with a new framework; consequently, according to the research, there has been no research on the social responsibility of dual education in an unstable environment in Ukraine so far. Therefore, the conceptual model of the study was chosen (Fig. 1) according to the research literature. The aim of the article is to justify a socially responsible dual education system in an unstable environment. The study was conducted during the year: November 2021 - November 2022 on the basis of 10 industrial enterprises and 13 higher educational institutions of Ukraine.

## **MATERIALS AND METHODS**

### *Survey design and data collection*

The present study is applied research in terms of its purpose and is a quantitative study in terms of its method. Data for the model was collected from three sources: 10 employers, 50 students in cooperative education and 13 institutions of higher education. Information was collected by Computer Assisted Telephone Interviewing (CATI) using a questionnaire developed on the Lemur survey platform of New Image Marketing Group. Telephone numbers of enterprises were selected from an open database YouControl - service of checking counterparties. The

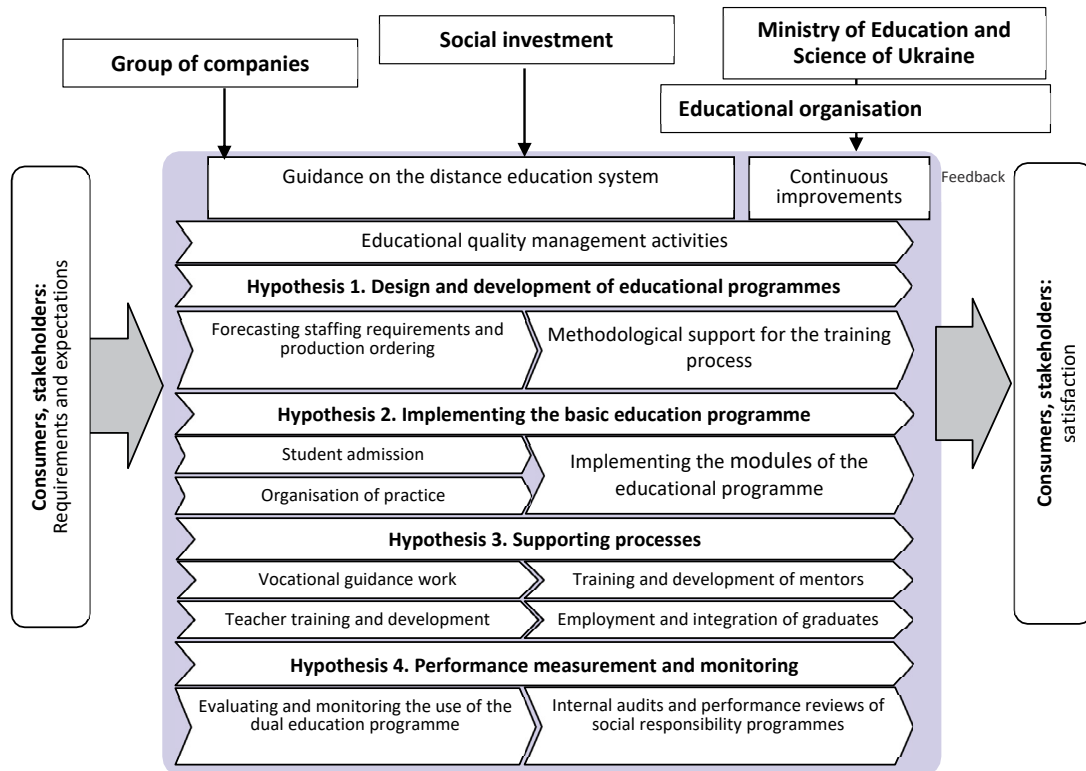


Fig. 1: Conceptual model for a socially responsible dual education system in an unstable environment in Ukraine

Table 1: Sample for the study amongst stakeholder groups – employers

The general population	Number of non-responses	Number of invalid answers	Number of valid responses
10	1	1	8

selection is random. The rotation order of the database was generated randomly. The questionnaire contained four groups of questions to measure the variables of the conceptual model and consequently to confirm the proposed hypotheses. The first set of questions concerned the experience of enterprises in designing and developing dual education programmes to train their staff (for employers-companies) (Kocsis and Pusztai, 2021); the second set of questions concerned the awareness of the effectiveness of enterprise-based dual education received (for students) (Cohen, 1998); the third set of questions concerned the organisation of supportive (enabling) processes (for educational institutions) (Selcuk, 2019); the fourth group of questions - to assess the effectiveness of the dual form of learning (for the stakeholders: state, society) (Cohen, 1998; Stevens and Shibanova, 2021). The

responses received were processed using a 5-point Likert scale, where a score of 1 was given when the respondent absolutely disagreed, 2 points disagreed, 3 points no opinion, 4 points agreed, 5 points absolutely agreed. Sample design: a total of 500 sets of numbers were made (Hair et al., 2014). Of these, 250 people were interviewed (rejection rate 77.5%). Responses to all questionnaire questions from 10 companies were obtained. Thus, the coefficient of valid responses is 0.11; the theoretical error without regard to the effect of the sample design is no more than 4.9% (Table 1).

*Building a conceptual model for a socially responsible dual education system in an unstable environment in Ukraine*

A socially responsible dual education system in an unstable environment in Ukraine consists of

four components, each corresponding to one of the proposed hypotheses: 1) design and development of educational programmes; 2) implementation of the basic educational programme; 3) supporting (enabling) processes; 4) measurement and control of effectiveness (Fig. 1).

The methodology of calculating each of the components of socially responsible dual education system in Ukraine is presented in the form of theoretical and practical model of dual education formation and implementation in unstable conditions of Ukraine (Fig. 2). As it can be seen from Fig. 2, each of the system components manifests one of the hypotheses of social responsibility of one or several participants of dual education process.

the first stage, in order to build a theoretical model of socially responsible system of dual training of qualified personnel in the conditions of crisis changes in Ukraine, a toolkit (questionnaires) was developed to conduct a survey among the main stakeholder groups: companies-employers, educational institutions, students. Further, the data was collected, analyzed, and the results were processed. In order to study the experience of employing companies using the form of dual training, the method of in-depth interview by telephone and case study was chosen. The sampling is solid. The average length of the interview was 20 minutes. The guide contained a list of mandatory topics for discussion, which made it possible to study the experience of the surveyed enterprises' cooperation with educational institutions in the organization of dual form of training, to identify and analyze the problems faced by employers, to collect suggestions for overcoming problems outlined by respondents to improve the effectiveness

## RESULTS AND DISCUSSION

Results of the implementation of the developed model

The research was carried out in three stages. At

<p><b>Hypothesis 1.</b> Design and development of educational programmes</p>	<p><b>Securing staffing needs:</b>  <math>L_S = N_{ij}/N_i</math>, where <math>N_{SFij}</math> – the need for the <math>i</math>-th category of personnel trained by the <math>j</math>-th dual education programme; <math>N_i</math> – the need for the <math>i</math>-th category of staff.  <b>Methodological support for the training process:</b>  <math>L_{MM} = N_{mm}/N_{us}</math>, where <math>N_{mtr}</math> – the number of distance learning tutorials; <math>N_{us}</math> – the number of users of the <math>j</math>-th educational programme (students, teachers, tutors).</p>
<p><b>Hypothesis 2.</b> Implementing the basic education programme</p>	<p><b>Student enrolment:</b>  <math>L_R = N_{Rij}/N_i</math>, where <math>N_{Rij}</math> – the number of applications submitted for the <math>j</math>-th dual education programme.  <b>Organization of internships:</b>  <math>L_{IS} = N_{ISij}/N_{STij}</math>, where <math>N_{ISij}</math> – the number of submitted applications for practice in the <math>j</math>-th dual education programme; <math>N_{STij}</math> – the number of students who study in the <math>j</math>-th dual education programme.  <b>Implementation of modules of educational programme:</b>  <math>L_{ME} = N_{MEij}/N_{STij}</math>, where <math>N_{MEij}</math> – the number of students who successfully completed the modules of the educational programme and passed the examination.</p>
<p><b>Hypothesis 3.</b> Supporting processes</p>	<p><b>Vocational guidance work:</b>  <math>L_{WG} = N_{Rij}/N_{AP}</math>, where <math>N_{Rij}</math> – the number of applications submitted for training in the <math>j</math>-th dual education programme; <math>N_{AP}</math> – the number of professionally oriented applicants.  <b>Teacher training and development:</b>  <math>L_{TCH} = N_{STij}/N_{GRj}</math>, where <math>N_{GRj}</math> – the number of study groups for the <math>j</math>-th dual education programme.  <b>Training and development of mentors:</b>  <math>L_{GR} = N_{STij}/N_{GRj}</math>, where <math>N_{STUTij}</math> – the number of students per mentor.  <b>Employment and adaptation of graduates:</b>  <math>L_{EMPL} = N_{STEMPLij}/N_{STij}</math>, where <math>N_{STEMPLij}</math> – the number of students successfully employed after completing the programme.</p>
<p><b>Hypothesis 4.</b> Performance measurement and monitoring</p>	<p><b>Evaluating and monitoring the use of the dual education programme:</b>  <math>L_{EVA} = N_{STEMPLij} \times P_{ij}</math>, where <math>P_{ij}</math> – the company's profit per employee.  <b>Internal audits and performance analysis of social responsibility programmes:</b>  <math>L_{SRP} = N_{STEMPLij} \times SB_{ij}</math>, where <math>SB_{ij}</math> – social payments per employee.</p>

Fig. 2: A theoretical and practical model of dual education formation and implementation in unstable conditions of Ukraine

Table 2: System of indicators of social responsibility of dual education in Ukraine

Indicators	Designation
Level of provision in staffing requirements, $L_S$	X <sub>1</sub>
Level of teaching provision, $L_{MM}$	X <sub>2</sub>
Level of provision in student admissions, $L_R$	X <sub>3</sub>
Level of provision in work experience, $L_{IS}$	X <sub>4</sub>
Level of provision for curriculum modules, $L_{ME}$	X <sub>5</sub>
Level of vocational guidance, $L_{WG}$	X <sub>6</sub>
Level of training and development of teachers, $L_{TCH}$	X <sub>7</sub>
Level of training and development of tutors, $L_{GR}$	X <sub>8</sub>
Level of employment and adaptation of graduates, $L_{EMPL}$	X <sub>9</sub>
Level of utilisation of the dual education programme, $L_{EVA}$	X <sub>10</sub>
Level of performance of social responsibility programmes, $L_{SRP}$	X <sub>11</sub>

of cooperation with educational institutions. The general population- 10 enterprises indicated by vocational higher and higher education institutions as partners in training applicants in the dual form of education. The processing of questionnaires made it possible to calculate 11 indicators of social responsibility of all stakeholders before and after the outbreak of hostilities in Ukraine. The deciphering of the symbols is shown in Fig. 2 and Table 2.

The proposed model was tested on the basis of 13 universities, 10 enterprises that responded positively to the questionnaire provided, 50 students who underwent dual training. The developed model of socially responsible system of dual training of qualified personnel is a business process of personnel training for an industrial enterprise structured as a set of basic and supporting processes, in which the requirements and expectations of consumers and stakeholders - business, government and citizens are identified at the input, and their satisfaction is assessed at the output (Fig. 2). The model also contains the scheme of joint managing influence of the state and business with the help of social investment tool, the implementation of which is the responsibility of dual education programme implementers - educational organization of vocational education. The functions of development, implementation, evaluation and monitoring of the dual education programme, organization of internal audits and formation of proposals for improvement of the system are performed by the group of specialists of the dual education system. This model has undergone a cycle of implementation at industrial enterprises in Ukraine, during which a package of local regulations and methodological tools was developed and applied, which allowed to distribute responsibility

between the company management and regional authorities, to form collegial management bodies, to describe, agree and regulate the functionality of the structural units of the enterprise and the educational organization. The main indicator of the effectiveness of the dual training programme is the employment of graduates in accordance with the need and requirements of production, expressed in quantitative and qualitative characteristics (the number of employed graduates and their qualification level). An analysis of the dynamics of companies' demand indicators for skilled workers and specialists in the pre-war period shows that it has not yet been possible to fully satisfy production demands. In order to analyse the impact of individual indicators on the social responsibility of dual education, a factor analysis was conducted (Table 3).

The results of data processing by factor analysis can be interpreted as follows: those indicators that do not affect the process under study are highlighted in black, those that do affect it are highlighted in red. In other words, the data in Table 3 shows that during the first research period 24.11.21 - 24.02.22 out of eleven indicators five ( $x_1, x_2, x_5, x_6, x_{10}$ ) influence the process; during the second research period 24.02.22 - 24.11.22 out of eleven indicators six ( $x_3, x_4, x_7, x_8, x_9, x_{11}$ ) influence the process. They are highlighted in red, respectively. That is, the data in Table 3 show that before the outbreak of hostilities, 5 out of 11 initial indicators influence the social responsibility of dual education, and after the outbreak of hostilities, 6 out of 11. In other words, before the outbreak of hostilities, employers were influenced to a greater extent by the possibility of meeting production needs for personnel trained through the dual programme and the economic effect obtained



Table 3: Results of factor analysis of the impact of individual indicators on the social responsibility of dual education (STATISTICA 10 listing)

Variable	Factor Loadings (Unrotated) (data)	
	Extraction: Principal components	
	(Marked loadings are >0,700000)	
	24.11.21 – 24.02.22	24.02.22 – 24.11.22
X <sub>1</sub>	0,937628	0,136939
X <sub>2</sub>	0,963231	0,213981
X <sub>3</sub>	0,179234	0,967737
X <sub>4</sub>	0,297035	0,923993
X <sub>5</sub>	0,938388	0,242523
X <sub>6</sub>	0,826765	-0,234214
X <sub>7</sub>	0,296315	0,741028
X <sub>8</sub>	0,278221	0,357436
X <sub>9</sub>	0,543605	0,782692
X <sub>10</sub>	0,885595	0,257035
X <sub>11</sub>	0,257035	0,897513
Explanatory Variable (Expl.Var)	5,348632	2,804293
Percentage of the total variance explained (Prp.Totl)	0,514863	0,380429

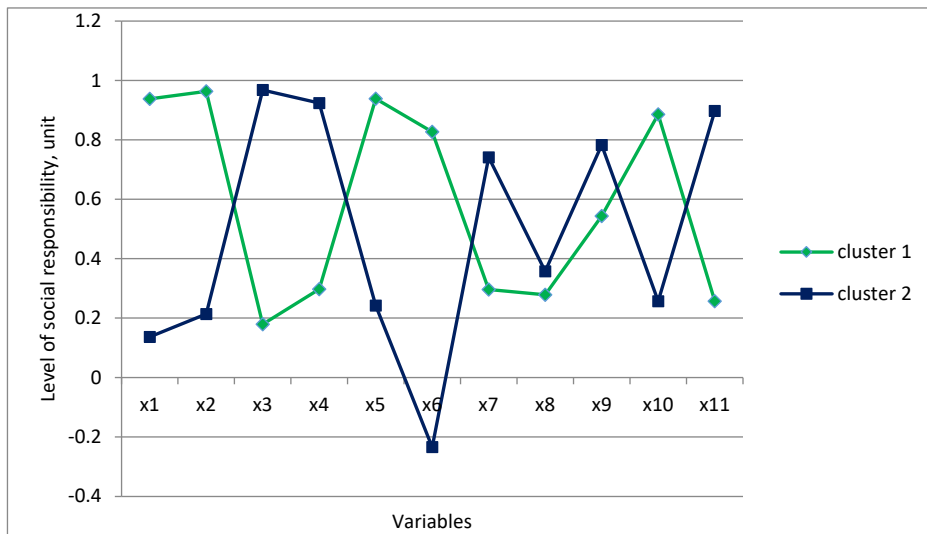


Fig. 3: Cluster analysis of the achieved level of social responsibility where cluster 1 - level of social responsibility for individual components of the dual education system before the outbreak of hostilities in Ukraine; cluster 2 - after the outbreak of hostilities

through the use of student labour in production. That is, the first and second hypotheses were confirmed: the complementation and integration of the 4 main interrelated components, the design and development of dual education programmes and the implementation of the basic dual education programme. This makes it possible to design and launch a socially responsible dual education system.

After the outbreak of hostilities, the priorities changed. Employers were now more interested in the availability of work placements to provide students with the necessary qualification skills. In other words, the third and fourth hypotheses are confirmed and come to the fore: organizing the supporting (enabling) processes), measuring and monitoring the effectiveness of dual education. This approach makes

it possible to ensure the functioning of the system, to evaluate and monitor the achieved level of social responsibility of dual education.

The equations of the dependencies of social responsibility performance for these 2 periods are as follows.

For the period 24.11.21 - 24.02.22 (Eq. 1):

$$Y_{SR24.11.21-24.02.22} = \frac{1}{5,348632} \times (0,0,937628x_1 + 0,0,963231x_2 + 0,938388x_3 + 0,826765x_4 + 0,885595x_5) \quad (1)$$

For the period 24.02.22 – 24.11.22 (Eq. 2):

$$Y_{SR24.02.22-24.11.22} = \frac{1}{2,804293} \times (0,967737x_6 + 0,923993x_7 + 0,741028x_8 + 0,357436x_9 + 0,782692x_{10} + 0,897513x_{11}) \quad (2)$$

The results of the cluster analysis of educational services according to the achieved level of social responsibility of logistical educational processes under martial law are shown in Fig. 3.

The dual training system implies organizational and resource participation of industrial companies in the vocational education of students and is associated with such expenses as remuneration and additional bonuses for teachers of educational organizations, hiring their own vocational trainers, providing, renting and maintaining premises, purchasing and servicing equipment, purchasing materials, providing students with special clothing and personal protective equipment, organising transportation to places. Part of the costs are borne directly in the company's budget, while part of the funding is transferred to the educational organisation in kind or in the form of targeted charitable donations. All of these social costs were inherent to companies for the beginning of military operations in Ukraine. After the outbreak of hostilities, the main indicator of the effectiveness of social investment for businesses is the training and employment of the required number of graduates from dual education programmes who meet the competence and qualification requirements of the employer, and the retention of trained personnel in the company and its location through the creation of attractive working conditions and social infrastructure. The trends identified in the research process in the preparation and implementation of dual education

confirm the views of many researchers (Šajeva, 2014; Selcuk, 2019):

- Thus, some researchers (Beaudoin, 2016; Beerkens et al., 2011) have found that poor vocational orientation of school and university entrants, students and graduates, lack of understanding of part of the target audience of the dual education programme what the future profession is and what the career prospects at the company are. Thus, the significance of Hypothesis 3: The third component (Organization of supporting (stimulating) processes) ensures the process of the dual education social responsibility system functioning. Therefore, in order to counterbalance this tendency, indicator  $x_6$  "Level of Career Guidance,  $L_{WG}$ " was included as one of the evaluation indicators in the model, which has a great impact on the level of social responsibility in the support processes phase of the dual programme.

- Also, some researchers (Ante and Ken, 2014; Baumann-Pauly et al., 2013; Chin et al., 2015) point out that the learning outcomes of the dual education programme do not meet the requirements of production. This approach violates the main points of Hypothesis 2: The first component (Design and development of dual education programmes) and the second component (Implementation of the basic dual education programme) allow to design and launch a system of social responsibility of dual education. In order to compensate for this trend, the indicator  $x_2$  "Level of methodological support of the educational process,  $L_{MM}$ " was included in the model at the design and development stage of the dual programme, and the indicator  $x_7$  "Level of teacher training and development,  $L_{TCH}$ " at the support process stage.

- Researchers (Campbell, 2018; Di Paolo and Matano, 2016; Donald et al., 2018) have also identified a mismatch between dual education programme outcomes and employer requirements (professional standards, corporate culture) identified in qualifying exams and employment testing. This violates the main points of Hypothesis 4: The fourth pillar (Measuring and monitoring the effectiveness of dual education) allows evaluating and monitoring the achieved level of social responsibility of dual education. In order to level out this tendency at the stage of supporting processes of the dual programme, the indicator  $x_9$  "Level of employment and adaptation of graduates,  $L_{EMPL}$ " was included in the model as one of the evaluation indicators.

- Also, according to the researchers (Geel and Backes-Gellner, 2012; Kocsis and Pusztai, 2021; Kuratko, 2005) low motivation of graduates to choose the target enterprise as a permanent and prospective place of work and career building due to weak attractiveness of the enterprise location and employees' place of residence contradicts the main statements of Hypothesis 3. This hypothesis argues that the organization of supportive (stimulating) processes ensures the process of dual education social responsibility system functioning. In order to compensate for this tendency, the indicator  $x_{10}$  "Level of use of dual education programme,  $L_{EVA}$ " was included in the model as one of the evaluation indicators during the measurement and control phase of the dual education programme. This indicator most closely reflects the potential for socio-economic incentives for personnel, including graduates from the dual education programme.

- Also, the decreasing trend in the number of graduates leaving for military service in the Ukrainian Armed Forces and the insufficient proportion of graduates returning after demobilisation identified by researchers (Cedefop, 2015; Hansen et al., 2011) suggests that the impact on this indicator, employers will increase the effectiveness of dual programmes. To counterbalance this trend, at the stage of measuring and monitoring the performance of the dual programme, indicator  $x_{11}$  "Level of performance of social responsibility programmes,  $L_{SRP}$ " was included in the model as one of the evaluation indicators. This indicator most closely reflects the social responsibility towards graduates of the programme who took part in military operations.

The field of challenges and opportunities for the social responsibility of dual education in a period of instability caused by military action in Ukraine has thus revealed a number of problems. One of the most important is the low level of mentoring, the involvement of industry representatives in the interaction with the target groups of young people.

## CONCLUSION

The theoretical contribution of the study is that the proposed set of hypotheses is an innovative system of dual education in the unstable conditions of martial law in Ukraine. The use of the proposed system allows, on the one hand, business to comply

with professional standards, develop employer branding, on the other hand, educational institutions and the state to perform the functions of social protection of graduates. The different perspectives of business and state on the training process of the dual education model is a valid reason for a stakeholder dialogue between partners and consensus building. Therefore, the approach to dual education system as one of the company's activities from the perspective of social responsibility is the most adequate strategy for building constructive interaction between business, authorities and students and their families interested in receiving quality professional education. The practical contribution of the conducted research is that the theoretical and practical model of social responsibility of dual education developed on the basis of the conceptual model allows: practically confirming or refuting the proposed hypotheses, identifying the prevailing trends in unstable conditions, designing methods of hedging the risks of reducing the quality level of dual education. The proposed theoretical and practical model for social responsibility of dual education is based on 11 calculated indicators. The proposed model of social responsibility of dual education is based on 11 calculated indicators. Factor analysis revealed that 5 out of 11 indicators influence the level of social responsibility of dual education before the war in Ukraine. The remaining indicators influence the level of social responsibility after the outbreak of hostilities. And it is more influenced by the provision of admission of students and in industrial practice. The low level of mentoring during this period has a negative impact on the level of social responsibility. The process integration scheme shows that a step-by-step implementation of the employer model of a practice-oriented (dual) learning process using stakeholder engagement and satisfaction methods within a social responsibility paradigm allows for a sustainable effect in the form of social investment by business and government, ensuring transparency and accountability to stakeholders and the community at large. In addition, the integration of production processes and dual education reveals the need to improve the institutional environment - additional regulation or, on the contrary, the elimination of certain requirements to reduce administrative barriers.

### Suggestions

According to the results obtained, the following suggestions are offered to higher education institutions and companies:

1. To use the developed theoretical and practical model of social responsibility of dual education by employers to create a talent pool, motivating graduates to continue their working career in the enterprise.

2. To create a socially responsible system of dual training of qualified personnel under conditions of instability in Ukraine in enterprises, using the experience and knowledge of trainers, using the elements of exit from the crisis and aspects of social responsibility management to improve the efficiency of personnel.

3. Increase the interest of graduate students to take part in dual education programmes both to improve their own qualifications, acquire unique skills, and get their first job.

4. To conduct this study in other educational institutions and companies, comparing the results with the results of this study.

### Limitations and future research

The present study is limited by the fact that it was conducted on the basis of higher education institutions and production enterprises. As a suggestion, more educational institutions (colleges, lyceums, vocational technical schools) could be involved to determine what other factors might influence the level of social responsibility of practice-oriented learning. More research is proposed to show the impact of different motivators on social responsibility job satisfaction, the results of the training received.

### AUTHOR CONTRIBUTIONS

O. Kolodiziev substantiated the research methodology, conceptualization, V. Shcherbak supervised the project administration, M. Krupka collected and analyzed literature, wrote the initial draft; V. Kovalenko did the research, observation; T. Kolodizieva did the visualization; V. Yatsenko did the software, the validation, the formal analysis.

### CONFLICT OF INTEREST

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism,

informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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### ABBREVIATIONS (NOMENCLATURE)

%	Percentage
AA1000SES	Stakeholder Engagement Standard - Accountability
BPMS	Business Process Management System
CATI	Computer Assisted Telephone Interview
Eq	Equation
ERP	Enterprise Resource Planning
Expl.Var	Explanatory Variable
Fig	Figure
IMO	World Migration Report 2022
IQNet SR10	Social Responsibility Management System
ISO	International Organization for Standardization

MES	The Ministry of Education and Science of Ukraine
PDCA	Plan-do-check-act
PIQS	Process Integrated Quality System
Prp.Totl	Percentage of the total variance explained
SR	Social responsibility
STATSTICA	Statistical analysis software package
TQM	Total Quality Management
Var	Variable

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