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ONLINE LABORATORY FOR EXCHANGE EXEMPLARY DIGITAL TRANSFORMATIONS AND ARTIFICIAL INTELLIGENCE MEANS

LABORATÓRIO ONLINE PARA TROCA DE TRANSFORMAÇÕES DIGITAIS EXEMPLARES E MEIOS DE INTELIGÊNCIA ARTIFICIAL

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Abstract

In recent years, unprecedented global changes have occurred in the digital and traditional worlds, associated with a significant acceleration of the impact of digital transformations and artificial intelligence means as one of the main factors of evolutionary and revolutionary engines of modern civilization, which provides unprecedented opportunities, problems and challenges for everyone. One of the ways, methods, and means of promoting sustainable development of individuals is our Online Laboratory for the exchange of exemplary digital transformations and artificial intelligence means. The best strategy, long-term plan is the balanced implementation of personally-centric projects with the support of a powerful ecosystem and scientific and educational infrastructure of online management systems, online laboratories with online schools, master classes and smart simulators of environments, situations, scenarios, procedures.

Keywords: digital transformations. artificial intelligence. online laboratory. person-centered project.

Resumo

Nos últimos anos, ocorreram mudanças globais sem precedentes nos mundos digital e tradicional, associadas a uma aceleração significativa do impacto das transformações digitais e da inteligência artificial como um dos principais motores evolutivos e

revolucionários da civilização moderna, proporcionando oportunidades, problemas e desafios sem precedentes para todos. Uma das formas, métodos e meios de promover o desenvolvimento sustentável dos indivíduos é o nosso Laboratório Online para o intercâmbio de ferramentas exemplares de transformações digitais e inteligência artificial. A melhor estratégia, plano a longo prazo, é a implementação equilibrada de projeto pessoa centrado, com o apoio de um ecossistema robusto e infraestrutura científica e educativa de sistemas de gestão online, laboratórios online com escolas e master classes online e simuladores inteligentes de ambientes, situações, cenários e procedimentos.

Palavras-chave: transformações digitais. inteligência artificial. laboratório online. projeto-pessoa centrado.

1. INTRODUCTION

In recent years, some unprecedented global changes have occurred, associated with a significant acceleration of digital transformations, a shift in the scientific and technological paradigm, the spread of innovative tools of artificial intelligence as one of the main evolutionary and revolutionary engines of sustainable development of modern civilization, being greatly influenced by the requirements, problems and systems for all.

The general problem arises in the fact that the huge potential for sustainable development in front of these innovative means of Artificial Intelligence (AI), personally-broad-centered literacy of all kinds through the implementation of sustainable large-scale innovation projects. is still being used insufficiently or ineffectively or even unnoticed or postponed for the future in practices of various purposes (Manako, 2024, p. 49), (Manako, 2025, p. 60) The results of authoritative studies show that less than half of projects have a digital strategy. 41% of organizations claim that they lack the right digital skills, and 30% claim that they know which technologies should be adopted, but 79% of organizations have not fully implemented AI governance at scale (PwC) (Farrell, 2024, p. 1). At the same time, demand for lifelong learning education services, training and advice on digital and AI literacy is growing rapidly (Mindigit, 2025, p. 1) (MON, 2023, p. 1.

> Educators, students, administrators, policymakers, program implementers, and lifelong learners are invited to explore and assess current practices, opportunities, issues, and challenges related to AI and recommendations for building education and learning system (UNESCO,2023 , p. 3).

The complex problem of understanding, explaining, predicting and controlling digital transformations in the general context of sustainable development of various subjects can be considered from various points of view (Manako, 2006, p. 78), (Manako, 2007, p. 64), perspectives, purposes, scientific and technological paradigms, theories, approaches (Manako, 2006, p.475), methods, models (Manako, 2004, p. 587), (Manako, 2005, p. 29) using various information processing tools. procedures, tools, services, taking into account relevant international and national guiding documents (ISO 10006, 2003, p.2), (Manako, 2003, p.14).

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> Digital transformation: cultural, organizational, and operational changes in an organization, industry, or ecosystem through the intelligent integration of digital technologies, processes, and competencies at all levels in a phased and strategic manner (Farrell, 2024, p. 1).

Project: A unique process consisting of a set of coordinated and controlled activities with start and end dates, performed to achieve a goal that meets specific requirements and that has constraints on time, cost, and resources (ISO 10006, 2003, p.2).

The following is a brief description of the innovative evolutionary project, tool with specific examples to improve understanding and explanation. Exemplary: concerns best practices, patterns of innovative digital transformations and AI of sustainable development of individuals, organizations, campaigns of states. Best practice: a process or methodology that is identified and recommended as a model; Assessment recommended as the most suitable way to solve a problem of a certain type. Pattern: a repeating pattern of a duel. An exemplary example of the digital transformation of Ukraine unique advanced projects, tools in the world Digital State, Digital Education. his is: a completely new essence and approach to education with programs for the sustainable development of abilities, literacy and competencies of individuals and a scale of success, will help self-realization, provide convenient access to knowledge and the opportunity to build individual educational trajectories (MON, 2023, p. 1).

2. WHAT IS A VLE?

VLE: is a science-intensive tool with reliable digital tools, AI tools in the form of integrated online laboratories (decision-making systems): Online Laboratory for the Exchange of exemplary digital transformations and artificial intelligence means. Evolutionary database of big data on the sustainable development of personally-centric projects, samples, insights into patterns; Online school with master classes for beginners, trainees and experts with smart Simulators of environments, situati-

ons, scenarios, procedures, which are sustainably improved on the basis of current packages of international and national guidance documents, laws, standards, technical notes, standard procedures, protocols and scenarios, etc. Types of Simulators: Virtual Reality (VR); Augmented Reality (AR); Haptic Feedback; Digital Twin. Digital twin: this is a simulator that simulates situations, scenarios of sustainable development with measurable accuracy in a generated virtual environment. and the corresponding reactions of imitators; Accuracy is one of the 4 mathematized criteria for critical assessment of the state of the problem-online space.

The purpose of VLE application: promoting the equifinality of sustainable development of projects of individuals through the practical implementation of our conceptual idea using an online complex management system, which is built on the basis of the developed formalized matrix-hierarchical structure model of VLE.

The purpose of VLE research and pilot projects. 1. To identify and improve conceptual, methodological and technical elements, ways of achieving them, which are the foundation for further successful planning and implementation of all work, promoting the sustainable development of personally-centered tools and projects. 2. Promoting the equifinality of online VLE systems to achieve the same final steady state in defined processes of person-centered sustainable development under different initial conditions, through different paths, strategies and trajectories. 3. Helping young people and adults acquire skills to critically perceive the impact of exemplary digital transformations and AI systems in order to survive and improve their lives, lifelong learning, work, social life through a sustainable increase in the level of personal literacy and competences of different types and purposes.

The idea of the VLE project is simple: to identify existing and imagined exemplary digital transformations and AI tools for sustainable development and to ensure their convenient exchange over time. The exchange covers many different processes such as lifelong learning, joint sensing, measurement, collection, cleaning, processing, storage, evaluation, visualization of information, providing feedback of all kinds of analytics. Of particular importance is the exchange of questions and answers in order to improve the search for valuable information samples, patterns , insights, regularities. A mathematical description, the status quo question model, is given in (Manako, 2025, p. 60). Status Quo: the current state of affairs. In 2010, the Berkeley Haas School of Business launched an initiative to codify its ecosystem by defining a unique set of Leadership and Partnership principles. As a value, the status quo question. One of the most powerful tools for improving our world, rooted in the ideal of the Changemaker, is not a formulaic process and does not look the same for everyone. Much depends on the environment, surroundings, experiences,

and a host of other factors (Haas , 2011, p. 3).

The conceptual idea of VLE is simple to mathematize existing and imagined exemplary systems, AI tools and ensure their exchange over a long period of time. This idea is based on the ideas of Academician V. M. Glushkov a new understanding of cybernetics, who back in 1957 defined the main direction of its development mathematization of computing technology and its applications (Glushkov, 1964, p. 11). He defined the paradigm AI is an additional means of human survival, the content of which is revealed in his 27 conceptual ideas (Kapitonova, 2011, p. 2).

One of the powerful means of sustainable improvement of understanding and explanation in conditions of multilingualism and multiculturalism of individuals is the use of metaphors [(Lipson, 1989, p. 15) , (Earl, 1989, p. 22), (Cakhnyuk, 2019, p. 31), in the form of a triad of problematic, metaphorical and online non-new spaces (commutative triangle of certain arrows).

Metaphor of explanation of the conceptual idea of VLE, naive definition-analogy - The WORKROOM of the famous science fiction writer H.G. Wells (1940).

> A vast, ever-growing wealth of knowledge is scattered throughout the world today. This knowledge would probably be enough to solve all the enormous difficulties of our days but it is scattered and disorganized. We need a purification of thinking in a kind of WORKROOM where knowledge and ideas can be received, sorted, summarized, assimilated, clarified and compared"

Knowledge: (initial level) To perform actions, to do something; information and skills acquired by a person through experience or education; theoretical or practical understanding of a subject; (advanced level) 1. The state of being familiar with something or being aware of its existence, usually the result of experience or study; 2. The extent of ones own understanding or information.

The mathematicised metaphor we have developed is simple it is the Escalator of Sustainable Development of Unique Person-Centered Projects, which represents the individual trajectories of project participants relative to established planned results and tasks. It is defined in the mathematical constructs of our arrow theory aimed at math., psych. Best FIrst Search, BFS exemplary solution based on best practice;

An example of a semantic interpretation of a metaphor [37, 38] in the form of two scenarios of the functioning of an individual or group Escalator track of individuals and their unique projects of life, work, lifelong learning, socialization:

1. A person can move up the steps of his escalator track himself (vertical reduction) or move sideways (horizontal reduction), having the necessary types of li-

teracy and competence. This Movement (arrow trajectories) determines and realizes the choice of the person himself or not, someone or AI;

2. The escalator unexpectedly and uncontrollably starts moving down or up with unpredictable accelerations, jerks under the control of AI from (possibly to a catastrophe, failures) or up (possibly to the ideal, achieving planned goals and results, victory. Exercise, task. Please outline your questions and comment, explain the available scenarios or cases in different contexts.

The main critical criterion for the VLE assessment is the systematic improvement of the set of measurable indicators of personal confidence and readiness to make an exemplary decision in the Status Quo of subjects in real time.

The VLE approach is implemented by promoting the development of a new understanding and explanation of sustainable development based on the best practices of digital transformations and AI in the form of an online system of personalized subprojects. Each participant in the VLE project is a consumer and contributor to the entire project. Subprojects are determined with the participation of international and Ukrainian parties with the Scientific Council of experts - individuals, legal entities. Implemented step-by-step in the form of a Defined Process, combining the adaptation and digital transformation of existing or imagined technical solutions with sustainable value addition. The approach is based on determinism as a fundamental assumption, empiricism as a basic guideline, experimentation as a basic strategy, repetition, the necessary requirement of reliability, parsimony as its conservative value, and philosophical doubt as its guiding conscience. It is implemented step by step, combining the adaptation and digital transformation of scientific and technical solutions with sustainable value addition using an adapted Agile approach. Agile: is a way of thinking and a philosophy that corresponds to a set of approaches (Scrum, Kanban, XP, Lean) and management methods (Management 3.0). They help: focus on the goals and needs of customers; simplify organizational processes; break the project into short cycles with detailed elaboration of the nearest stages; actively use feedback; reasonably increase empower teams; integrate rapid response work tools into everyday life. A key feature of the Agile methodology is to create comfortable conditions for maximum value as a result of the work of the entire project team.

The VLE digital transformation strategy is defined on the basis of our Mathematical Inheritance Model and the BFS Task Register. The strategy is aimed at: systematic and sustainable improvement of value, understanding, progress, accessibility, reliability, safety, efficiency, certainty and exemplary decision-making. The strategy is evaluated on the basis of a critical analysis of the Status Quo of the triad

of problem, metaphorical, online spaces.

The main principle of sustainable development of VLE in natural language: People should not run after , samples but vice versa, samples should run after people. Or in other words, All arrow patterns are made as person-centered, metaphorical, known, practical as possible, and move in a timely manner with the best practices of the person/

Mathematized principles of sustainable development of VLE.

The MiniMax principle: This is the principle of unity of close and long-term goals (horizontal and vertical reduction) with rules such as. Minimal options are implemented top-down, starting from the maximum. And vice versa - Maximum options are implemented bottom-up, starting from the minimum. Given the acceleration of digital transformations in changes, subprojects are appropriately reviewed every three years, and . scientific and experimental VLE subprojects annually using an integrated Agiil approach.

The principle of Personal-centricity: The minimum unit. of subprojects is the personal project of each project participant; AI is an additional reliable means of survival and sustainable development, decisions are made by a person; .

The principle of BFF based on best practice: FFT is Best First Search (Best First Search BFS) of an exemplary solution.

The principle of Duality: If there is something, then there is usually its double (and vice versa), which is represented in convenient forms in two basic spaces at the same time - problem and -physical. The construct Double is defined in a formalized dictionary with different meanings such as ...doubles contain Contextual double. Psychological Mathematical double, Metaphorical double. Digital double, Artificial double,

The principle of "Partial understanding" If something is not defined, then it refers to a more generalized one.

The basic scientific disciplines of VLE are mathematics, psychology, linguistics, pedagogy, computer science.

Benefits of using VLE:

Personal confidence and readiness: Reliability: Reliability metrics are defined and applied based on scalable VLE best practices, allowing individuals to perform a personal project with a reliable counterpart in a virtual environment with reliable tools. This way, personal confidence and readiness to make exemplary decisions about mine loyalty in real time is achieved

Safety: Significantly reduces the risk of injury by allowing individuals to train in a virtual environment.

Accessibility: Makes training more accessible as simulators can be deployed in different locations, reducing costs and the need for redeployment.

Cost-effectiveness: Reduces the costs associated with organizing live training events and ensuring safety protocols in traditional training environments.

Scalability: Facilitates training of large numbers of beginners, trainees and others according to assessment criteria and systematically improves everyones readiness for exemplary digital transformations.

3. SUSTAINABLE DEVELOPMENT MODELING VLE

In the context of accelerating evolution, digital transformation and the widespread use of AI, the shift of understanding and explanation of sustainable development, the evolutionary VLE project is organized in a mathematized form with mathematized constructs and reference sets of metadata regarding the following categories in the Matrix-Hierarchical Structure Model: Consolidated Register of Tasks (Learning Objectives), Defined Processes with Target Areas, Indicators of Sustainable Improvement using the AI Toolkit and Demonstrators of Sustainable Development Results.

In general, the VLE is implemented and evaluated based on a Common Model with metadata about: Samples of decision-making according to standards, typical procedures, protocols and scenarios; Samples of description, forecast, control and visualization of valuable information and insight; Samples of person-centered readiness in the current and planned state in real time.

The VLE project team achieves uniqueness by: Systematic and sustainable improvement of understanding and use; Metaphorization, mathematization and visualization of description, prediction and control; Analysis of the Status Quo using tools. AI, Big data, real-time analytics of all kinds.

The statement of the general problem of developing models in our arrow theory at the highest level of Abstraction (i.e., from the paradigmatic model) is written as a combination of arrows in angle brackets (Manako, 2025, p. 60).:

<natural language description of object X> $\leftrightarrow\updownarrow$ <mathematized description of object Y>

The arrow $\leftrightarrow$ denotes the transition from one description (state) to another at the established level of Abstraction (Intention) or its Implementation (Expression), Manifestation, that is, when the Expression becomes available to end users and an

Instance of Manifestation such as a unique personal project. The arrow ↕ denotes the transition from between these descriptions in the opposite direction. In other words, ↔↕ denotes the application of horizontal and vertical reduction procedures. These procedures are carried out in the form of a Defined Process in the constructs of our arrow theory such as commutative triangles, Cartesian squares, pyramids, etc. of arrows (hereinafter referred to as the ARR method). An example of a meaningful interpretation of the Cartesian construct is a square with vertices (ends of arrows) subject-object, form-content; a commutative triangle of spaces: problem, metaphorical, and online. An example of a natural language description of a system-building construct is an arrow: learning unit, event, idea, didactic method, step, situation, resource, measurement, stimulus, reaction, experience of practice, result, learning task, test, question, answer, explanation, exam, test, stage, change, section of the learning space or environment, lesson, commutative triangle teacher-student-class, Cartesian square, polygon, pyramid, pattern, fractal, function, taxonomy, forecast, input-output, means of survival, success or not (catastrophe, ideal); means of improving someone's life or not.

It is important to understand that the mathematized description of the construct ↔↕ corresponds to the natural language description and meaningful interpretation (and vice versa) Models of matrix-hierarchical structuring of decision-making systems. These models are a common method of building any system (organization, phenomenon). It involves a vertical division into decision-making levels with a clear subordination of lower levels to higher ones. Lower-order elements are combined into higher-order categories according to the rules of vertical and horizontal reduction. This provides structuring, ordering and functioning of complex management systems. The following construction and principle are used to describe the matrix hierarchy of structures in our models.

VLE project categories: 1. Register of tasks "Good practice. Learning with artificial intelligence"; 2. Defined processes of sustainable development with good practice;; 3. Indicators of sustainable improvement; 4. Toolkit with reliable AI; 5. Demonstrators of project results.

CONSOLIDATED REGISTER OF TASKS Good practice. Learning with artificial intelligence. The models of the Task Register are described in our models such as: Data analysis models of lifelong learning of a subject; Paradigmatic model of understanding and using artificial intelligence in learning. Model of mathematical description of the Task Register in the form of an input-output system, a decision-making system.

$\langle\langle datasupplier(generator)\rangle\ \langle\Delta\rangle\ \langle datareceiver\rangle\rangle$

$\langle\langle datagenerator \rangle\rangle \leftrightarrow\updownarrow \Delta \leftrightarrow\updownarrow \langle\langle datareceiver \rangle\rangle$

Sets of sections <data generator>: «process> <object> <consumer> <non-consumer». Types of data origin: <role: consumer>, <role: non-consumer>, <object>, <process>, <system>, <environment>; <data receiver>: the process of communication from the subject with stakeholders in order to report its results;

<>: the process of the cycle section «transformation> $\leftrightarrow\updownarrow$ <visualization> $\leftrightarrow\updownarrow$ <evaluation»

(arrow triangles are commutative); <transformation> - a set of workflows for organizing data for storage in a consistent form that corresponds to the semantics of the data set and the method of its storage; narrowing down observation and monitoring data sets; creating new variables, functions from existing variables or calculating a set of summary statistics;

<visualization> - the process of providing answers (reaction) to questions posed or new questions about the data. Constructive widget: an object of the Pyth programming language containing many events that have a representation in the browser;

<evaluation> - the action or case of making a judgment about something: the act of evaluating something; assessment. threat assessment. assessment of achievements and progress.

Explanation of the construct<visualization> - Analytical panel: "a user interface based on predefined measured data flows and data exchange, to which the end user can apply filters and graphical display methods to improve (understand, optimize) activities (functions, works, operations) to achieve set goals (results, outputs) and which is suitable for regular use with minimal training

In the process of data analysis, a set of descriptions is determined ṫdimensionality of variables in space (Cartesian product) , K = «K1>, <K2>, ..., <Ki>, ...». Each Ki has its own discrete measurement scale, in particular, a partially or linearly ordered set of values. The order of these values is formally described using certain types of relations and values.

Levels of assessment of sets of sites: experimental set - has the following characteristics: implemented; goals (outputs, results) are systematically not achieved or partially achieved;; managed set - has the following characteristics: implemented; goals are achieved; there is planning, monitoring and regulation; work products are appropriately established, controlled and maintained; a typified set has the following characteristics: managed; uses measured information and analysis and control methods to improve the process; is built on the basis of reference (base) models of parameter aggregations, basic procedures; a predicted set has the fol-

lowing characteristics: typified; is managed on the basis of quantitatively measured information; variability limits are established for normal implementation. If necessary, they are re-established after appropriate corrective actions, i.e. variations are controlled within the established limits; an exemplary set (proven, optimized, best practice) has the following characteristics: predicted; there is evidence (evidence) of compliance with rules and requirements; is constantly improved to achieve current and planned goals (results); changes (innovations) in the process are managed; process optimization is carried out. The specified formulations of assessment characteristics are general, i.e., their detailed structure is established for each set of assessments. For each set of assessments, the levels of achievement and progress are also indicated in the form of percentage ranges and their names.

Examples of the second and third levels in the Model of the matrix-hierarchical structure of registers and tasks, project and learning portfolios throughout life and samples of individuals with reference sets of metadata";

1.1. Working environment, space of pilot projects

1.2. bilingual Online Encyclopedia VLE for youth and civil servants

Registers of lifelong learning units

Formalized dictionaries

Classifications and taxonomies

Metadata sets

1.3. Demonstrator of the Repository, big data base (Life Memory) of the evolution of samples of practices of implementation of person-centered projects

1.4. Demonstrator of mass Lifelong Learning of target groups of youth and civil servants of Ukraine

1.5. Demonstrator of the Simulator

DEFINED PROCESSES of sustainable development with good practice. Structure of defined processes that intertwine and unite the VLE: Structure of work process tasks: Regulations; Automated conversion of structures, testing and evaluation; Information processing, analytics, export-import, self-assessment, interaction-communication; Visualization of patterns and clusters; Ensuring evolvability, interoperability, scalability, protection and confidentiality.

The OECD Council on November 8, 2023 adopted a new definition of artificial intelligence, which will be included in the new European Union regulation on AI. It defines its very scope:

> An AI system is a machine system that, in order to achieve explicit or implicit goals, makes inferences based on the Inputs it receives about how to generate Outputs, such as predictions, content, recommendations, or decisions that

> [can] affect the physical or virtual environment. Different AI systems vary in their level of autonomy and adaptability after deployment"(Vuorikari, 2022, p. 1).

Mathematical meaningful interpretation in arrow theory: An AI arrow system is a purposeful set, matrix, graph, collection . of arrow constructs that aims to achieve explicit or implicit goals, representing a set of target arrows by transforming arrows with ends input and output data. Example of output data: a target set of arrows that denote content, recommendations, or decisions that [can] affect the physical or virtual environment.

In our models, the following definition is proposed.

Defined Process (DP): A process (Process, project area) that can be used step by step to achieve a defined aggregation of IGT objects (IGT: «IGT-content>, <I-content>, <G-content»); T-content: Content that defines one or more I Tasks; C-content: Content that defines one or more goals G-content; and Task-content: A goal in a defined context; C-content: Content that defines one or more Tasks; Step: A structure of activities that is defined to aggregate IGT objects.

Explanation of the definition and understanding of the concept of "DP step": 1). Definition of one or more activity structures described within the established model; 2). Value chain in the organization; 3). Current best practice understanding of the essence of the steps: value adding and e-knowledge sharing network; 4). Establishment of a clear strategic framework that is implemented step by step.

Example of the goal of building a VLE: Satisfied People with AI skills and competencies for lifelong learning, work, socialization. DP resources: guidance materials (rules, standards, methodology, strategy, best practices, guidelines); procedures, training, tools, services, methods; - role structure. Roles can be performed by a person and/or a machine (e.g. a service). The key conceptual understanding of the role structure is that] a person (individual) is described and viewed as a virtual entity that can perform roles that are actually performed by a group, organizational units, organization as a whole, etc. The term organization is used in the sense of ISO standards. High-level roles in a certain hierarchy of roles are used in reference metadata sets to describe resources: Creator, Contributor, Publisher - an entity responsible for making a resource available in a given form. Examples of values: a person, an organization or a service. The performance of roles is improved on the basis of lifelong learning, acquired experience and critical thinking.

Process, project area: a set of related practices that, when implemented together, satisfy a set of goals that are considered essential for improving and opti-

mizing a process, project. Where practice: an activity (functions, work, operations) that contributes to the goals or outputs of a process, project or increases its capabilities; acquired experience, a set of skills, specific knowledge in a certain field of activity. A process, project area is also a means of grouping activities (inputs-outputs, works, activities, functions, operations, etc.) according to their contribution to the possibility, potential, maturity of the process, project.

An example of a mathematical representation of a process, project area: a Jordan block in a multidimensional matrix of a process, project.

Definition of the second and third levels in the Matrix-Hierarchical Structure Model

(3.1) Profiling and Project Management

Approaches

Expert Council and Targeted Virtual Groups

Virtual Networks, Aggregated Evaluation Nodes

Distribution of Roles, Authorities, and Responsibilities

Regulations

Procedures

Time Planning

Communications

(3.2) Development Modeling

Functionality and Content Aggregation Models

Context

Explanations

Commentaries

Metaphors

Situations

Behavior

Memory

BFS

(3.3) Processes and Services of the UN System, UNESCO

(3.4) Laboratory of Sample Evolution

Scientific and Practical Context

Educational Context..

(3.5) Laboratory of Virtual Classrooms, Master Classes of Training with Samples

(3.6) Laboratory of Training with Smart Simulators

Register competencies, situations, scenarios, procedures

(3.7) Strategies and scenarios

(3.8) Network of virtual departments and centers

TOOLKIT with robust artificial intelligence. Masterclass methods to achieve learning goals: Behaviorism (Body and Mind); Information Processing and Cognitive Psychology, Individual Constructivism, Social Constructivism and Situational Learning. Features of the working tools to improve the value of the Simulator: Virtual Reality (VR): Offers immersive experiences that make training scenarios realistic, improving learning and memorization; Augmented Reality (AR): Can overlay digital information on the real world, useful for practical training exercises in semi-controlled outdoor environments; Haptic Feedback: Includes haptic feedback devices to simulate the physical feel of working with tools and equipment, adding another level of realism to training. Digital twin: we simulate situations, scenarios of the most likely events with the generated virtual corresponding reactions of the simulators of the detection means to them.

Definition of the second and third levels in the Matrix-Hierarchical Structure Model

(5.1) Working tools for supporting sub-projects:

(5.2) Dialogue

(5.3) Communications

(5.4) Networks

Person

(5.5) Risk management

(5.6) Reliable AI

(5.7) Analysis

Applied Behavior Analysis

Data mining

Methodology Step-by-Step

(5.8) Tools from scientific disciplines

Psychology

Mathematics

Pedagogy of lifelong learning

Linguistics

Informatics

(5.9) Forms of content presentation

INDICATORS of sustainable improvement Categories of analysis of the as-

sessment of the person's behavior (signals): Conceptual systematic, Applied, Analytical, Technological, Effective assessment. Dimensions of the assessment of the person's behavior analysis:

Conceptual systematic assessment signals that changes in the person's behavior and interpretations of how and why the procedures and scenarios used were effective should be described in terms of relevant standards and recommendations. Applied assessment signals the effects on the improvement of the person's behavior. Analytical assessment signals that the person experimenting should be able to control the occurrence and non-occurrence of the behavior. Technological assessment signals when all operational procedures are defined and described with sufficient detail and clarity. Effective assessment signals that the person is effectively using the techniques of behavior and improving it to a certain extent

Categories of mathematized criteria in the VLE Assessment Model: Accurate, Valuable, Simple, Practical. Accurate (Definite) means systematically aimed at predicting results with a high degree of accuracy based on the analysis of large-scale data to increase the reliability of information, taking into account assumptions, uncertainties and errors. Valuable means systematically providing individuals with valuable information, forecasts and recommendations in order to help them make the right decision, make the best choice. Simple means systematically aimed, on the one hand, at building an intuitive semantic framework that every user (from a beginner to an expert) would be able to adapt to their needs, expectations, easily modify, explain and interpret. On the other hand, Simple means systematically aimed at reducing the internal complexity of the problem or the complexity of the information. Problem Complexity is a measure of how much time, space or other resources are required to solve a problem or perform a task or assignment. Information Complexity is a measure of the total number of properties transmitted by an object and detected by the observer. Practical means systematic and timely consideration of factors and changes that affect the simulated real situation in order to provide useful information and forecasts, recommendations, and feedback that are relevant and important for making better decisions..

Definition of the second and third levels in the Matrix-Hierarchical Structure Model

(3.1) Profiling and Project Management

Approaches

Expert Council and Targeted Virtual Groups

Virtual Networks, Aggregated Assessment Nodes

Distribution of Roles, Authorities, Responsibilities

Regulations
Procedures
Time Planning
Communications
(3.2) Development Modeling
Functionality and Content Aggregation Models
Context
Explanations
Commentaries
Metaphors
Situations
Behavior
Memo

BFS

(3.3) Processes and Services of the UN System, UNESCO, EU
(3.4) Online Laboratory of Sample Evolution
Scientific and Practical Context
Educational Context
(3.5) Laboratory of Online Classes, Master Classes of Training with Samples
(3.6) Laboratory of Training with Smart Simulators
Register of Competencies, Situations, Scenarios, Procedures
(3.7) Strategies and scenarios
(3.8) Network of online departments and centers
(3.9) Development indicators
(3.10) Metrics
Psychometric
Mathematical
Computational
Technical
Educational
Caliper metrics (Caliper,2023, p.1).
(3.11) Space system indicators
(3.12) Non-territorial system indicators

DEMONSTRATION. Our Strategy is aimed at promoting the following results of promoting the sustainable development of VLE within 3-5 years. Dimensi-

ons:

Millions of young people and civil servants of Ukraine will acquire all types of literacy and competences in a balanced way with the help of tens of thousands of experts, scientists, postgraduates, students, psychologists, mathematicians, IT specialists, educators, lecturers and teachers of Ukraine, and their curators and experts from leading foreign centers.

Innovative models of sustainable development of our turnkey theory with targeted value addition in an international approach, inheritance strategies;

Powerful organizational and technological base for ensuring the sustainable development of the triad of virtual organization spaces - problem, metaphorical and online (with the construct of the commutative triangle and the general metaphor "Escalator of life"). An effective Scientific and Expert Council has been formed, with Targeted Thematic Groups of Experts, Regulations, Visions of the Future, Missions, etc. A pilot project of analytical panels of the User Interface and powerful functionality of the virtual organization website. A powerful experimental base of millions of unique personally-centered pilot projects based on exemplary good practices;

An information base with current samples of personal projects, questions, explanations and comments from stakeholders;

Specialized online schools with master classes for sustainable development with unique projects of individuals, samples of their solutions in various contexts;

Presentation of the project in the form of a dynamic multidimensional matrix is a necessary condition for automating project management, achieving planned goals and results.

The basic mathematical model of sustainable development of the VLE project is a dynamic, flexible and multidimensional matrix with target areas of defined processes and functional-hierarchical structures of personally-centric unique projects, which are described above.

Application of this matrix: transforming it into Jordan normal form, which provides a powerful tool for analyzing the properties of matrices. The Jordan matrix is much easier to study than the original matrix. It is used for the purpose of: Analyzing dynamic systems; To study the behavior of systems over time; Classification of matrices: Grouping matrices by their structure, etc. The introduction and use of these constructs in the VLE provides the opportunity to effectively use:

> Principal Component Analysis (PCA): a linear dimensionality reduction method used in exploratory data analysis, visualization and data preprocessing. The data is linearly transformed into a new coordinate system in such

> a way that the directions (principal components) that reflect the greatest variation in the personal project data can be easily identified. These directions (i.e., principal components) constitute an orthonormal basis in which the different individual dimensions of the data are linearly uncorrelated. In many AI studies, two principal components are used to plot the data in two dimensions and visually identify clusters of closely related points data (Markopoulos, 2017, p. 4252).].

Definition of the second and third levels in the Matrix-Hierarchical Structure Model

of AI literacy skills of individuals.

1. Problem solving and tasks: 1.1 creative use of digital technologies and AI tools to create ideas and knowledge and implement innovations in processes, products, services; 1.2 perform individual and group cognitive processing of information and data to understand and solve conceptual problems, current tasks and problem situations in the online space.

2. Identifying gaps in multiliteracies and competencies: 2. understand who, where, when, why and how to timely update and balance all types of literacy and competence; 2.2 be able to support others in the purposeful development of their achievements: 2.3. seek opportunities for self-development and stay abreast of digital evolution.

4. DISCUSSION

> In order for a person to understand at least one word, the entire language as a whole and in all its relationships must already be embedded in it (Wilhelm von Humboldt)

A metaphor to improve understanding and explanation of our approach, the strategy of sustainable development of the VLE for the subject: We can let the future happen or take the trouble to imagine it. We can imagine it dark or light - it depends on this what it will be like (David Gelertner, 2000).

In our arrow theories, abstract mathematical entities are considered real, and others are their meaningful interpretations.

Do they exist independently, are they real, independent of us, or are they created by our brain for practice? Moreover, this is a complex complex problem.

In the work of academician V.A. Shirokov it is emphasized that Modern linguistics, having realized that the object of its research language is evolutionary, has an informational nature, and in the substantive sense is a carrier of intelligence, has faced a cardinal problem for itself: to realize and understand at the fundamental level the nature of the emergence and formation of connections between language and natural and artificial intelligence (and vice versa) (Shirokov, 2022, p. 6) .

Other examples of natural language description of definitions of an object from different points of view.

a mathematical object see definition and questions in (Sharma, 2024, p. 1).

The LTSC IEEE standard Metadata of an educational object defines (LOM, 2002, p.3): an educational object, LO: Any entity, digital and non-digital, that can be used for learning, education or training. This standard is the first part of a standard consisting of many parts and specifies metadata for educational purposes. This standard specifies a conceptual data schema that defines the structure of a metadata instance that describes a learning object. The conceptual data schema provided in this part of the standard allows the linguistic diversity of learning objects and the metadata instances that describe them to be reflected. This conceptual data schema specifies the data elements that constitute a metadata instance for a LO. Purpose of a LOM: to facilitate the discovery, evaluation, acquisition and reuse of LO, for example by learners, teachers or programmed processes. This standard as a whole also facilitates the exchange and dissemination of LO by allowing for the creation of catalogues and lists of LO, while taking into account the diversity of cultural and linguistic contexts in which these LOs and their metadata are used

Psychological objects (Brock, 2015, p. 152: these are the things that psychologists study. Some examples can be found by reviewing the contents of an introductory psychology textbook. These include perception, memory, learning, intelligence, personality, attitudes and motivation, and attitudes. The four main goals of psychology are to describe, explain, predict, and change or control the minds and behavior of others. As an interdisciplinary and multifaceted science, psychology includes a wide range of subfields, such as social behavior, human development, and cognitive functions. See more in the article History of Psychological Subjects. The eight different types of psychology include abnormal, biopsychology, cognitive, developmental, forensic, industrial-organizational, personality, and social psychology. Each field offers unique perspectives and practical applications in the real world.

Research question, problem: How to truly define the evolutionary object of sustainable development VLE (register unit and their potentially infinite combinations?) for each of the subject's conciliators with their unique psycho-linguistic-

cultural properties, characteristics throughout life? OR How to define and improve the arrow metaphor Memorial of Life?

Unexpected conclusions and at the same time amazing mathematical constructions of the description of this phenomenon evolutionary object of sustainable development arise from the point of view of, for example, number theory in the form of Fibonacci numbers, exponential growth of complexity, etc. But this is a completely different story, which will be presented in subsequent works.

Nevertheless, we still believe in the power of our arrow theory.

Research question, problem. See also (Mesarovich, 1978, p. 7), (Zgurovsky 2005, p. 154): How to prove the identity between X and Y a description of X?. Examples of answers regarding understanding the difference: prove that X is an ideal analogue of Y and vice versa; catastrophe metaphor: the subject evaluates something and does not understand that his literacy and competencies are not enough to see in X and Y the White Crow. There are many research questions regarding the communication model. How to determine the context? How to determine and use the basic language of the subject?; How to determine and use the relevant methods and tools of the subject? Is there no difference if there is an algorithm that proves that the information about X and Y is identical.

5. RESULTS

An approach and basic mathematized models are proposed for the construction and use of an innovative scientific online Means for exchanging ideas and exemplary digital transformations and its application in the context of dynamic management systems: an online network of DT and AI Departments in scientific centers of the National Academy of Sciences and the Ministry of Education of Ukraine, online encyclopedias on literacy and competence of youth and adults, and an open system of defined processes with virtual spaces, environments, laboratories of a virtual organization based on the Ukrainian Language and Information Fund and the Institute of Cybernetics of the National Academy of Sciences of Ukraine, and an online complex system , which provides maintenance, accumulation, processing, evaluation and updating of the Big Data database on the targeted development of exemplary and personally-centric projects for understanding and explaining the effects of changes in problem, metaphorical and online spaces, BFS, exchange of valuable information and insight. Basic mathematized models have been developed. The planned and already achieved results of the project and the use of the means over 3-5 years are described.

6. CONCLUSION

In the era of digital transformations and AI, promoting a shift in thinking and understanding based on the integration of scientific and technical achievements from various disciplines in various fields of application, states is becoming an important scientific and practical problem. Therefore, our approach to creating and using an innovative online Means for exchanging ideas and exemplary digital transformations and AI systems and their applications is aimed at promoting the targeted development of dynamic online management systems in the form of an Online Network of DT and AI departments in scientific centers of the NAS and the Ministry of Education of Ukraine, online Encyclopedias on the issues of AI literacy and competencies for youth and civil servants, Digital literacy and competencies; Linguistic (language) literacy and competencies Literacy and competencies of lifelong learning; Psychological literacy and competencies; Mathematical literacy and competencies; The open system of defined processes of our Means includes: virtual spaces, environments, laboratories, virtual organizations based on the Ukrainian Language and Information Fund and the Institute of Cybernetics of the NAS of Ukraine in order to promote pilot projects, achieve long-term goals and planned results through the participation in these projects of thousands of experts, scientists, graduate students, students, psychologists, linguists, mathematicians, IT specialists, educators, lecturers and teachers of Ukraine and many other young people, students, graduate students, specialists and, especially, Ukrainian civil servants of all ranks. The virtual laboratory, space, environment "Memoir of Life- provides maintenance, accumulation, processing, evaluation and updating of the Big Data database for the purposeful development of exemplary and personality-oriented projects. Covers issues of understanding and explanation in the triads of cyberspaces (digital, lifelong learning, innovative) and problem, metaphorical and online spaces of the Tool, First Best Search - BFS, exchange of valuable information and understanding. A basic mathematical Model of the hierarchical structure of the Means has been developed to facilitate optimization of the project as a whole and the Means in the form of a dynamic, flexible and multidimensional matrix with target areas of defined processes and hierarchical structures of personally-centric sub-projects. It should be noted that the defined process of our Strategy (long-term plan) is based on the already achieved project results and testing of important components of the Means.

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