ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
ECONOMIC STUDIES

Volume 28 (5), 2019

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# STRATEGIES OF HUMAN DEVELOPMENT IN THE CONTEXT OF GLOBAL DIGITAL CHANGE

*Despite the fact that people are living in the early days of the upgrading digital economy, in the recent years, it has already had a huge impacts on their human development and the evolutionary progress of the modern society. The main problems that need to be solved are developing innovative strategies to manage human development and to consider the digital change influence. The current research purpose is to define an available institutional background to create different strategy models for human development under the condition of global digital change in Ukraine. The article is based on international indicators of human development and digital change in Ukraine, which has been analyzed to define current national economy positions and calculate probable strategies. The main constitutive characteristics, features, and functions of human development components are defined. The dynamic and static analysis of national human development positions is made (HDI, HCI, PI). The strengthening, neutral and weakening of national economy are researched (SNW analysis). A framework of macro-environmental factors for human development in the area of digital change is scanned (PEST analysis). The above mentioned strategic models create basic to calculate possible innovative strategies probabilities under conditions of global digital change (Transition matrix of Markov chain). The innovative human development and digital change strategies are represented within one-side, balanced and prevail models. The strategic national priorities realization is possible in case of balanced models both for human development and digital change realization in Ukraine.*
*JEL: G41; I25; I32; O3; M52*

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## Introduction

The rapidly growing tendencies of globalization are characterized both for economic and social development in the 20th and 21th century worldwide. The globalization process is connected with the increasing integration of diversified input and output. Central to the entire globalization theory is the concept of digital technologies that are rapidly changing our economy and society. Digital technologies play a critical role in the maintenance of human life, including constantly evolving, transforming and improving.

Despite the fact that people are still living in the early days of the upgrading digital economy, in the recent years, it has already had a huge impact on the social and economic development worldwide. The formation of a new socioeconomic model is decisive for the transition of the national economy and its main determinants. The digital transformations and social and economic changes are among the most important peculiarities of the Fourth Industrial Revolution (4IR). The digital capability model is developed as the new way for business upgrading that aims at transformation of technological process and changes in roles of humans in it. One of the most important peculiarities is that robots become humans' substitutes in a wide range of modern industries. The upgrading digital business conception is flexible, full of innovations and experiments. This conception will create new innovative business opportunities and boost their productivity (Vasilyeva, 2018; Antoniuk, 2017; Matyushenko, 2017).

The digital process means the integration of digital technology into business and everyday life. For instance, 71% of interviewed by DEL EMC and Enterprise Strategy Group (ESG) companies agree that they are not enough competitive without digital (IT) transformation; 95% of respondents pay their attention to the digital technologies unless these companies are able to lose their business competitiveness; the most companies that are recognized to be successful define informative and communicative technologies (ICT) as competitive advantage and profit center (DeMattia, 2017; Press…, 2017). Evidence suggests that the digital revolution is one of the greatest opportunities for social development. It becomes one among the strongest drivers for social and economic growth, life quality and well-being. Information and communications technology (ICT) influences existing business models, products and services.

## The literature review and problem statement

Our society faces a great variation in the level and distribution of social and economic indicators across different countries. Early research on economic growth emphasized natural economic connections intended to describe how the national economy changes with economic growth, including income distribution. In the context of global transformations, the particular links between economic growth and human development are explored. For reasons of practicality recent studies began to present data on changes over time both in economic and social areas, identifying constantly technologies changes and revolutions. There is evidence that intensification plays a crucial role in regulating human development

and national economy competitiveness (Fields, 1989; Deininger and Squire, 1996; Ramirez, Ranis, Stewart, 1997).

The importance of the global digital transformation influence on human development is confirmed by the results of numerous studies. The formation of network management based on the benefits of digitalization has a pivotal role in Castells' research (1999), who defines the network structure as set of interrelated digital units and the network undertaking as particular entity able to generate knowledge, to process information effectively, to adapt itself to changing market conditions, to be flexible for rapid change in organizational and economic instruments under influence of radical cultural, technological, and institutional reforms, and to implement innovation as major competitive advantage (Matyushenko, 2017; Castells, 1999; Castells, 2000).

In the scientific context, the term "digital economy" appeared in the researches of American scientist Negroponte in 1995 (Negroponte, 1995). However, despite a rather long period of concept study, there are still a lot of different points of view. In particular, digitalization is supposed to be deeply connected with a knowledge, information or network economy (Semenyuk, 2017; Derviş, 2012; Galbraith, 2007). Due to the further rapid development and transformation in the business environment at the end of the 20$^{th}$ century, businessmen participated in digitalization researches. In particular, Tapscott and Williams focused on the digital economy formation and represented the definition of wiki economy (Tapscott, 1997; Tapscott, 2010). This is explained by the fact that business is still often inexperienced and expected to face huge challenges brought about by the new revolution, particularly in developing countries.

A key issue is that digitalization is not the only business challenge. Further company success depends both on the economic and social activity of companies. Socio-structural shifts, networking and technological increase, represent the major components of economic and dynamics, which is a fundamental constant in our world (Virilio 1989; Farjoun 2010).

Recent studies have shown the far-reaching integration of information and operational technologies. Surveys such as that conducted by Schwab (2015; 2017), Richards (2016) and Dittrich (2016) have shown the main specifications and possible effects of the Fourth Industrial Revolution (4IR). Moreover, several attempts have been made to underline a particular 4IR nature and differences between the Third Industrial Revolution and the Fourth Industrial Revolution. The benefits of upgrading digital economy development have been documented in world innovative industrial and consulting companies' reports, including McKinsey, Philips and Bosch.

There has been some research conducted in the area of human development and high-tech innovative changes by experts of international and regional organizations. In particular, some parts of above-identified problems have been reflected in:

- UN programs and reports (Transformation of our world: Sustainable Development Agenda 2030; World Investment Report 2017);
- NATO (The Shared Perspective of the World in 2030 and Beyond: Themes and Drivers; Multiple futures project – Navigating towards 2030);

- World Business Council for Sustainable Development (WBCSD) (Vision-2050. The new agenda for business).

Although a lot of foreign researches have been conducted on the above-mentioned problems, there are still a lot of questions that remain unanswered. There are only a limited number of published domestic studies that provide important information on digitalization and peculiarities of its advantages implementation in the context of human development in Ukraine.

**Research purpose**

The current research summarizes data from the social and economic reports of international organizations as well as other theoretical and practical evidence. The aim of this article is to define an available institutional background to create different strategy models for human development under the condition of global digital change in Ukraine. In particular, attention is paid to the national human development positions within the social and economical worldwide framework. The strengthening, neutral and weakening of national economy are researched (SNW analysis). A framework of macro-environmental factors for human development in the area of digital change is scanned (PEST analysis). The above mentioned strategic models create basic to calculate possible innovative strategies probabilities (Transition matrix of Markov chain).

The results should be viewed as establishing the stylized background for national innovative human development strategies rather than as tests of formal theories or models.

**Research methodology and materials**

The research methodology is based on foreign and Ukrainian scientific literature monographic, descriptive and meta-analysis, which is used for describing the problem statement. In the presented research the method of comparative analysis was also used. Its aim was to compare available theoretical concepts with already existing human development solutions. Analytical and quantitative information, namely international human development and digitalization rankings, statistical data and documents are used as background to analyze the tendencies of current institutional background for national innovative human development strategy.

The most popular composite statistic indicator of human development is the Human Development Index (HDI) that was created to emphasize that people and their capabilities should be the main criteria for assessing the level of country development, not only the indicators of economic development and growth. This index is used to compare national economies with the same levels of Gross National Product, paying attention to the indicators of their human development outcomes. HDI means an average measure of three main components, namely: health, education and standard of living. There are some HDI modifications, including Inequality-adjusted Human Development Index (IHDI), Gender Development Index (GDI), Gender Inequality Index (GII), Multidimensional Poverty Index

(MPI), which represent the deeper understanding of social development (Human Development Report, 2017).

Determining the impacts of human development on social and economic growth, the researchers of the International Food Policy Research Institute (IFPRI) calculate the Global Hunger Index (GHI). The World Economic Forum (WEF) deals with researches on the Global Competitiveness Index (GCI), which is deeply connected with human development indicators. The level of competitiveness of national health protection and culture resources is also calculated within The Travel & Tourism Competitiveness Index by WEF. The static basic of human development is human capital (Human Capital Index (HCI) by WEF). The dynamic characteristics and human development components are represented within Social Progress Index, Genuine Progress Indicator, Inclusive Development Index and Prosperity Index.

One of the most significant current discussions in human development is rapidly changing technology (3D-printing, robotics, neuro- and digital technologies) that is a permanent feature in the global economy and defines national economies' competitiveness. Therefore, governments and private investors around the world are investing in digital economy development. The world digital competitiveness ranking is yearly calculated (Cabolis, 2017).

By using some statistical tools, the important social and economic parameters, defining the level of indicators performances for human development under the condition of global digital change, are analyzed in our research. Matrix methods are used to create a framework for national social and economic competitiveness evaluation, identifying its strengths and weaknesses. In particular, digital economy opportunities are underlined within assessment models and strategies.

On the basis of research methods, the already existing institutional background for human development in Ukraine is compared to possible strategies of human development under the condition of global digital change. The suggestions and workable solutions, examples and propositions can be inspirational for future scientific research and especially in practical application of presented research models.

## Results

In the new global economy, Ukraine is mainly considered as the economy with a higher than average level of human development. In particular, the Human Development Report (HDI) identifies the national policies and key strategies to ensure human development in Ukraine as an average, including the high potential to sustain and protect national social development and gains (Human Development for everyone, 2017). The Ukraine's Inequality-adjusted Human Development Index (IHDI) values and ranks are comparable to those that are higher than average in the world. However, the values of adjusted indexes are lower in comparison with HDI. Therefore, determining the impacts of social and economic instability on human development is important both on global and national levels.

Recently, there has been renewed interest in poverty in the context of human development. Ukraine's Multidimensional Poverty Index (MPI), which includes the poverty level in highly-developed as well as in the third world countries, is positioning our country between countries with rather high poverty levels. The national Gender Development Index (GDI) positions are higher Gender Inequality Index (GII) that has heightened a rather high level of education among women.

Since it was reported in the Human Development Report for Ukraine, the current indicators of human development have not been the only subject attracting considerable interest. Therefore, one of the greatest challenges for the national economy is sustainable human development potential. Up to now, far too little attention has been paid to HDI structural changes in Ukraine.

Our country belongs to the category with a rather high level of human development. However, the highest is the contribution of progress toward increasing tendencies in the area of education during the period between 1990 and 2015. Thus, the increase of the expected years of schooling value is 2.9 years compared to 2.2 years for the mean years of schooling value and 1.3 years for the life expectancy at birth value. Contrary to above mentioned tendencies, no increase in GNI per capita was detected. The decrease in GNI per capita is 31.9% since 1990. The above-mentioned data approve the dynamic concept on the national potential of human development.

At the same time, the knowledge and skills embodied in individuals that enable them to create economic value are defined as human capital. The Human Capital Index is calculated by the World Economic Forum. The main elements of human capital are capacity, development, deployment and know-how. The global human capital is assessed within five groups in accordance with generations, namely: 0-14 years, 15-24, 25-54, 55-64, and 65 years and older. Ukraine's rank is 24 among 130 countries that are taking into account. On average, the level of global human capital is only nearly 62%, compared to 70% in Ukraine (The Global Human Capital Report, 2017). In order to compare the dynamic and static indicators of human development in Ukraine, the SNW analysis is used in our study that sought to answer the specific research questions on strengthening (S), neutral (N) and weakening (W) of human development in Ukraine (Table 1).

The current SNW analysis recognizes the main elements of human development strengths and weaknesses in Ukraine. For example, our research determines the importance of literacy criteria, gender equality in higher education, staff-training and opportunities for their development and the number of part-time employees. However, the main part of human development weaknesses is connected with a number of problems related to the healthy life duration, vocational education coverage, high-tech industries employment and unemployment rate.

Debate continues about the best human development strategies for its elements that are represented both with social and economic components. Therefore, the particular attention of the international organizations is paid to sustainable human development that is deeply connected with prosperity. Prosperity Index (PI) is calculated by Legatum Institute in Great Britain. In 2017 Ukraine's rank was 112 among 149 countries. However, the prosperity

pillars are rather variable that are displayed in Table 2 (Sustainable Development Goals, 2019; State Statistics Service of Ukraine, 2019).

Table 1

SNW-analysis of human development elements in Ukraine

| *Criteria*** | ***S*** | ***N*** | ***W*** |
|---|---|---|---|
| *1* | *2* | *3* | *4* |
| Primary education coverage | ***X*** | | |
| Secondary education coverage | ***X*** | | |
| Vocational education coverage | | ***X*** | |
| Gender equality in higher education | ***X*** | | |
| Primary education enrolment | ***X*** | | |
| Secondary education enrolment | ***X*** | | |
| Education quality | | ***X*** | |
| Unemployment rate | | | ***X*** |
| Partly employment rate | ***X*** | | |
| Variety of professions (qualifications) | | ***X*** | |
| Economic complexity | | ***X*** | |
| The share of employed with average qualification | | | ***X*** |
| Healthy life expectancy at birth | | | ***X*** |
| Healthy life expectancy at 65 | | | ***X*** |
| Employment rate in high-tech industries | | ***X*** | |
| Staff training | | ***X*** | |

** The criteria are chosen in accordance with the World Economic Forum methodology.

The most strengthen is the education pillar that ranks countries on the access to education and its quality, human capital quality. Educational strength contributes to other pillars balancing. However, the weakest are social capital positions. Social capital pillar measures the strength of personal relationships and network support. The low social capital rank shows the particular need to activate available national education potential for sustainable human development in Ukraine. The Prosperity Index methodology provides the possibility to create different human capital models, which depend on levels of importance to each of the Prosperity Index's pillars. For instance, the feature of adjusting pillar weighting allows doubling the weight of educational component in Ukraine. In case of above mentioned changes, the national economy will be on the 106$^{st}$ position in the human capital rating comparing to the current 112$^{th}$ position.

The current study of the Prosperity Index shows recent trends in social and economic development and provides an important background for sustainable human development models creation.

Table 2

Legatum Prosperity Index in Ukraine

| Time frame | PI Value | Economic quality | Business environment | Governance | Education | Health | Safety and security | Personal freedom | Social capital | Natural environment |
|---|---|---|---|---|---|---|---|---|---|---|
| *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | *11* |
| Ranking | | | | | | | | | | |
| 2007 | 95 | 67 | 108 | 113 | 47 | 98 | 103 | 76 | 141 | 129 |
| 2008 | 95 | 73 | 113 | 115 | 49 | 103 | 82 | 82 | 141 | 119 |
| 2009 | 104 | 75 | 120 | 122 | 60 | 113 | 83 | 81 | 144 | 119 |
| 2010 | 103 | 76 | 96 | 117 | 51 | 129 | 76 | 92 | 115 | 120 |
| 2011 | 100 | 76 | 99 | 129 | 45 | 121 | 80 | 90 | 118 | 119 |
| 2012 | 97 | 87 | 97 | 119 | 43 | 110 | 86 | 90 | 125 | 117 |
| 2013 | 97 | 77 | 106 | 127 | 45 | 111 | 169 | 89 | 137 | 115 |
| 2014 | 102 | 77 | 101 | 124 | 39 | 110 | 118 | 86 | 128 | 110 |
| 2015 | 107 | 88 | 97 | 128 | 45 | 111 | 132 | 91 | 135 | 112 |
| 2016 | 107 | 88 | 97 | 128 | 45 | 111 | 134 | 93 | 135 | 112 |
| 2017 | 112 | 84 | 102 | 130 | 48 | 135 | 135 | 95 | 115 | 108 |
| Value (maximum 100) | | | | | | | | | | |
| 2007 | 52.52 | 60.57 | 40.55 | 37.15 | 60.72 | 65.78 | 62.01 | 57.94 | 39.12 | 48.86 |
| 2008 | 52.86 | 60.06 | 40.60 | 37.74 | 60.71 | 64.67 | 64.48 | 55.39 | 40.17 | 51.98 |
| 2009 | 51.87 | 60.17 | 39.39 | 35.83 | 59.52 | 61.50 | 65.13 | 55.58 | 37.85 | 51.82 |
| 2010 | 52.56 | 60.06 | 45.90 | 36.90 | 60.61 | 56.75 | 66.39 | 50.17 | 43.53 | 42.73 |
| 2011 | 53.04 | 59.96 | 46.44 | 35.10 | 62.43 | 59.34 | 65.29 | 53.13 | 42.53 | 53.12 |
| 2012 | 53.38 | 58.34 | 48.47 | 35.86 | 62.33 | 63.66 | 64.30 | 51.31 | 42.22 | 53.96 |
| 2013 | 53.93 | 59.87 | 47.97 | 34.40 | 62.18 | 63.53 | 67.41 | 53.16 | 42.00 | 54.85 |
| 2014 | 53.38 | 60.00 | 48.67 | 36.00 | 63.20 | 63.36 | 57.30 | 53.35 | 42.71 | 55.83 |
| 2015 | 52.59 | 58.73 | 49.66 | 34.56 | 63.14 | 63.02 | 53.77 | 51.48 | 42.49 | 55.44 |
| 2016 | 52.44 | 58.73 | 49.66 | 34.56 | 63.14 | 63.02 | 53.47 | 51.48 | 42.49 | 55.44 |
| 2017 | 51.75 | 58.74 | 49.88 | 35.75 | 62.47 | 55.23 | 50.15 | 51.41 | 45.49 | 56.65 |

Note: Table is based on [39; 40].

The current research recognizes the critical role played by Prosperity Index pillars, which are considered in accordance with PEST (STEEPLE) analysis and represented in Table 3.

As can be seen from the table (above), a particular PEST-analysis modification has been used within our research to describe a framework of social and economic pillars in the context of human development strategies creation. Traditionally, PEST-analysis is based on four main pillars, namely: political, economic, socio-cultural and technological pillars. There are several expanded modifications of PEST-analysis. In particular, STEEPLE-analysis includes socio-demographic, technological, economic, environmental (natural), political, legal and ethnic factors. According to the main challenges faced by our researchers, the following pillars are highlighted: political and legislative pillars, economic, socio-cultural and environmental pillars.

Table 3

Pillars of sustainable human development in Ukraine

| Political and legislative pillars | Economic pillars |
|---|---|
| 1. Changes in the legislative framework on social issues.<br>2. Actions aimed to combine political and social priorities.<br>3. Changes in international social legislation.<br>4. Integration of national economy into international organizations promoting the idea of sustainable human development.<br>5. Elections to legislative and executive authority (changes in social policy directions).<br>6. Public regulation in the social area and public priorities of human development establishment | 1. Structure of public local budgets expenditures review in the context of social expenditures growth<br>2. Actions to reduce inflation and unemployment.<br>3. Taxation mechanisms and instruments review<br>4. Review of social business expenditures standards.<br>5. Review of economic incentives system for social entrepreneurship. |
| **Socio-cultural pillars** | **Environmental pillars** |
| 1. Transformations in the existing system of main values in society.<br>2. Life quality changes<br>3. Changes in education.<br>4. Change in attitude to research.<br>5. Change in attitude to work and rest.<br>6. Changes in medicine.<br>7. Changes in the cultural area. | 1. Air pollution changes.<br>2. Changes in energy nature.<br>3. Increased access to the drinking water of high quality.<br>4. Measures to preserve the density of green plantations. |

Note: The table is based on Property Index criteria.

Political and legislative pillars include tax policy, labor law, environmental law, trade restrictions, tariffs, consumer law, antitrust law, employment law, health and safety law and political stability. Moreover, the above-mentioned pillars influence health, education and infrastructure development. Therefore, sustainable human development is possible due to the changes in national and international legislative frameworks to support human development and social entrepreneurship.

Economic pillars are based on economic development and growth, interest, exchange and inflation rates, unemployment. These pillars act as an economic background for human development. The economic impact on human development effectiveness mainly depends on the possibilities to connect social priorities with available economic potential.

Socio-cultural pillars include health and cultural changes, gender and age distribution, career attitudes. These pillars impact how society and businesses operate in the social area and make social and culture decisions.

Environmental pillars are connected with ecological and environmental changes. The attention is paid to weather and climate changes, including tourism, farming, and insurance support. The highest impact of environmental pillars occurs when national and global social and economic development strategies include activities on environmental changes.

The national human development strategy represents the combination of above mentioned pillars. A key issue of human development strategy is the search of random variables $X_1$, $X_2$ … $X_n$, which are represented by possible scenario of pillars combination according to discrete-time Markov chain methodology. The state-space of the chain is 0.25 to adapt the available combinations to research needs (Table 4).

Table 4

Human development strategic models data

| № | Strategic models | Human development pillars value | | | |
|---|---|---|---|---|---|
| | | Political and legislative pillars | Economic pillars | Socio-cultural pillars | Environmental pillars |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | One-side | 0 | 0 | 0 | 1 |
| 2 | | 0 | 0 | 1 | 0 |
| 3 | | 0 | 1 | 0 | 0 |
| 4 | | 1 | 0 | 0 | 0 |
| 5 | Balanced | 0.25 | 0.25 | 0.25 | 0.25 |
| 6 | | 0.5 | 0.5 | 0 | 0 |
| 7 | | 0.5 | 0 | 0.5 | 0 |
| 8 | | 0.5 | 0 | 0 | 0.5 |
| 9 | | 0 | 0.5 | 0.5 | 0 |
| 10 | | 0 | 0.5 | 0 | 0.5 |
| 11 | | 0 | 0 | 0.5 | 0.5 |
| 12 | | 0.75 | 0.25 | 0 | 0 |
| 13 | Prevail | 0.25 | 0.75 | 0 | 0 |
| 14 | | 0 | 0.75 | 0.25 | 0 |
| 15 | | 0 | 0 | 0.75 | 0.25 |
| 16 | | 0 | 0 | 0.25 | 0.75 |

The main available combinations of human development strategy pillars are represented in the form of Matrix 1.

$$P = \begin{bmatrix} X_{11} \dots X_{12} \dots X_{1n} \\ X_{21} \dots X_{22} \dots X_{2n} \\ \dots \\ X_{m1} \dots X_{m2} \dots X_{mn} \end{bmatrix} \quad (1)$$

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}; \begin{bmatrix} 0{,}25 & 0{,}25 & 0{,}25 & 0{,}25 \\ 0{,}5 & 0{,}5 & 0 & 0 \\ 0{,}5 & 0 & 0{,}5 & 0 \\ 0{,}5 & 0 & 0 & 0{,}5 \end{bmatrix}; \begin{bmatrix} 0 & 0{,}5 & 0{,}5 & 0 \\ 0 & 0{,}5 & 0 & 0{,}5 \\ 0 & 0 & 0{,}5 & 0{,}5 \\ 0{,}75 & 0{,}25 & 0 & 0 \end{bmatrix}; \begin{bmatrix} 0{,}25 & 0{,}75 & 0 & 0 \\ 0 & 0{,}75 & 0{,}25 & 0 \\ 0 & 0 & 0{,}75 & 0{,}25 \\ 0 & 0 & 0{,}25 & 0{,}75 \end{bmatrix}$$

Using the above-mentioned matrix it is possible to calculate the main scenario of human development strategy. At the same time, one of the greatest challenges of our society is digitalization. In particular, the "Concept for the Development of the Digital Economy and Society of Ukraine for 2018-2020" was adopted in 2018 in Ukraine.

The key issues of the Concept are the following Ukraine's achievements in the international rankings till 2020: 30th place in the Networked Readiness Index (WEF) (64th place in 2016); 40th places in the Global Innovation Index (INSEAD, WIPO) (56th place in 2016); 50th places in the ICT Development Index (ITU) (79th position in 2016); 60th place in the Global Competitiveness Index (WEF) (85th place in 2016) (Table 5) (On Approval…, 2018).

Table 5

Digital models data

| № | Goals achieving models | Index value | | | |
|---|---|---|---|---|---|
| | | Networked Readiness Index | Global Innovation Index | ICT Development Index | Global Competitiveness Index |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | One-side | 0 | 0 | 0 | 1 |
| 2 | | 0 | 0 | 1 | 0 |
| 3 | | 0 | 1 | 0 | 0 |
| 4 | | 1 | 0 | 0 | 0 |
| 5 | Balanced | 0,25 | 0,25 | 0,25 | 0,25 |
| 6 | | 0,5 | 0,5 | 0 | 0 |
| 7 | | 0,5 | 0 | 0,5 | 0 |
| 8 | | 0,5 | 0 | 0 | 0,5 |
| 9 | | 0 | 0,5 | 0,5 | 0 |
| 10 | | 0 | 0,5 | 0 | 0,5 |
| 11 | | 0 | 0 | 0,5 | 0,5 |
| 12 | | 0,75 | 0,25 | 0 | 0 |
| 13 | Prevail | 0,25 | 0,75 | 0 | 0 |
| 14 | | 0 | 0,75 | 0,25 | 0 |
| 15 | | 0 | 0 | 0,75 | 0,25 |
| 16 | | 0 | 0 | 0,25 | 0,75 |

The state of the system is represented within our research as a vector (Matrix 2):

$$p_0 = [p_1\ p_2\ \dots\ p_n] \tag{2}$$

$$[0\ \ 0\ \ 0\ \ 1];\ [\ \dots\ ];\ [0{,}25\ \ 0{,}25\ \ 0{,}25\ \ 0{,}25];\ [\ \dots\ ]$$

The current system is in the state n. Two time periods later the system is in the state n+2 (Matrix 3):

The Matrix of different models probability in the state n+2 is represented in Table 6.

Table 6

Human development strategic models under conditions of global digital changes

| Human development strategic models | | Digital models | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | *One-side* | | | | *Balanced 1* | | | |
| | *One-side* | 1 | 0 | 0 | 0 | 0.25 | 0.25 | 0.25 | 0.25 |
| | | 0 | 1 | 0 | 0 | 0 | 0 | 0.5 | 0.5 |
| | | 0 | 0 | 1 | 0 | 0 | 0.5 | 0 | 0.5 |
| | | 0 | 0 | 0 | 1 | 0.5 | 0 | 0 | 0.5 |
| | *Balanced* | 0.5 | 0 | 0 | 0.5 | 0.4375 | 0.1875 | 0.1875 | 0.1875 |
| | | 0.5 | 0 | 0.5 | 0 | 0.375 | 0.375 | 0.125 | 0.125 |
| | | 0.5 | 0.5 | 0 | 0 | 0.375 | 0.125 | 0.375 | 0.125 |
| | | 0.25 | 0.25 | 0.25 | 0.25 | 0.375 | 0.125 | 0.125 | 0.375 |
| | | 0.75 | 0.25 | 0 | 0 | 0.1875 | 0.3125 | 0.25 | 0.25 |
| | | 0 | 0 | 0.5 | 0.5 | 0 | 0.5 | 0.25 | 0.25 |
| | | 0 | 0.5 | 0 | 0.5 | 0 | 0.25 | 0.5 | 0.25 |
| | | 0 | 0.5 | 0.5 | 0 | 0.375 | 0.375 | 0.25 | 0 |
| | *Prevail* | 0 | 0 | 0.25 | 0.75 | 0.0625 | 0.375 | 0.3125 | 0.25 |
| | | 0 | 0 | 0.75 | 0.25 | 0.125 | 0.75 | 0.125 | 0 |
| | | 0 | 0.75 | 0.25 | 0 | 0.125 | 0.375 | 0.375 | 0.125 |
| | | 0.25 | 0.75 | 0 | 0 | 0.125 | 0.375 | 0.125 | 0.375 |
| | | Digital models | | | | | | | |
| Human development strategic models | | *Balanced 2* | | | | *Prevail* | | | |
| | *One-side* | 0 | 0.5 | 0.5 | 0 | 0 | 0 | 0.75 | 0.25 |
| | | 0.5 | 0 | 0.5 | 0 | 0 | 0.25 | 0.75 | 0 |
| | | 0.5 | 0.5 | 0 | 0 | 0.25 | 0.75 | 0 | 0 |
| | | 0 | 0 | 0.25 | 0.75 | 0.75 | 0.25 | 0 | 0 |
| | *Balanced* | 0.5 | 0.25 | 0.25 | 0 | 0.4375 | 0.437 | 0.062 | 0.062 |
| | | 0.5 | 0.25 | 0 | 0.25 | 0.5 | 0.375 | 0.125 | 0 |
| | | 0.5 | 0 | 0.25 | 0.25 | 0.5 | 0 | 0.375 | 0.125 |
| | | 0.3125 | 0.3125 | 0.1875 | 0.1875 | 0.5 | 0 | 0.125 | 0.375 |
| | | 0 | 0.25 | 0.25 | 0.5 | 0 | 0.5 | 0.125 | 0.375 |
| | | 0.375 | 0.37 | 0 | 0.25 | 0 | 0.375 | 0.125 | 0.5 |
| | | 0.375 | 0.12 | 0.25 | 0.25 | 0.1875 | 0.062 | 0.375 | 0.375 |
| | | 0 | 0.5 | 0.37 | 0.12 | 0.5625 | 0.187 | 0.125 | 0.125 |
| | *Prevail* | 0 | 0.37 | 0.5 | 0.12 | 0.0625 | 0.75 | 0.187 | 0 |
| | | 0 | 0.37 | 0.25 | 0.37 | 0 | 0.562 | 0.375 | 0.062 |
| | | 0 | 0 | 0.5 | 0.5 | 0 | 0 | 0.625 | 0.375 |
| | | 0.1875 | 0.75 | 0.0625 | 0 | 0 | 0 | 0.375 | 0.625 |

## Conclusions

The previous section has shown that the great measure of human development strategies has a possibility to be implemented under conditions of digital change. The findings can contribute to a better understanding of:

- dynamic and static structure of human development that provides detailed information about the contribution of human development components in the general indicator growth. Thus, the Ukrainian economy holds rather high current positions in educational rankings that support national competitiveness in the part of social development. However, the national economy isn't still among the most competitive economies in the part of economic development, in particular current positions in GNI per capita rankings. Therefore, progressive changes in institutional background for human development are possible under conditions of sustainable social and economic development;
- main strengths and weaknesses of Ukrainian economy that support the view about human development in the context of the health industry, scientific, educational and cultural growth, considering its collaboration with innovation in technological development, new digital technologies growth;
- main pillars for human development and digital technologies use that shows the level of national commitment in the human development and digital technologies on the global level that shows the measure of the integration of the national economy into global digital society;
- human development strategic models under conditions of global digital changes and such models combinations, namely: one-side, balanced and prevailing strategies. The balanced strategy is a type of management and control, aimed at balancing different pillars of human development and digitalization. Such activities are generally divided equally between digital technologies' growth and main human development components. The one-side strategies aimed to develop the potential of the particular human development component. Prevail strategies represent the unequal division of resources between different human development components.

In conclusion, these studies show that the main part of strategic priorities realization is possible in the case of balanced models both for human development and digital change realization in Ukraine. This study should, therefore, be of value to practitioners wishing to combine available theoretical models methodology with available data from human development rankings to estimate the possibility to achieve new digital technologies goals.

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